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PRACTICAL OBSTETRICS.

A TEXT-BOOK FOR

PRACTITIONERS AND STUDENTS.

BY

EDWARD REYNOLDS, M.D.,

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PREFACE.

In the present over-written condition of medical literature it is, perhaps, fitting that the preface to any new book should contain an excuse for its existence. The favorable reception accorded to an earlier volume which aimed only at rendering the technical details of obstetrical practice accessible to the student, and was, therefore, intended to be merely an accessory to the more extended text-books, together with the opinion of the publishers that a more extended work, based on the same lines, would fill a want in the literature of the subject, have been the reasons for the preparation of this book.

It is founded upon an extended experience in clinical teaching, and expresses the belief of the authors that the general principles of a subject are rendered more intelligible and interesting to the student when presented in connection with the practical details of bedside work.

If it appears to settle most points of practice dogmatically, the fault has been intentionally committed in the belief that a description of one justifiable plan of treatment is likely to be of more benefit to students than an extended discussion of the advantages and disadvantages of many methods.

EDWARD REYNOLDS,
FRANKLIN S. NEWELL.

BOSTON, SEPTEMBER, 1902.

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PART I.

PREGNANCY.

CHAPTER I.

THE ANATOMY OF THE FEMALE PELVIS AND GENITAL ORGANS.

ALTHOUGH it is not within the scope of this book to attempt a description of anything more than the obstetrical anatomy of the female pelvis and its contents, nevertheless a brief description of the pelvic organs must be included in it, because a clear idea of the main anatomical features of the female organs of generation is a *sine qua non* of the intelligent practice of obstetrics.

It is upon the variations from the normal that many of the more important obstetrical complications depend, and it is the knowledge of what the normal condition should be that enables us to recognize them early and to treat them successfully; yet, as a fair knowledge of the general anatomy is presupposed in the reader, it is only necessary to briefly recapitulate the points of obstetrical interest.

THE FEMALE ORGANS OF GENERATION.

The genital organs and structures of woman are commonly divided into the external and internal genitalia. The former comprise the mons veneris, the labia majora and minora, and the vestibule, with the urethral orifice and the clitoris. The latter include the vagina, uterus, Fallopian tubes, and ovaries. (Fig. 1.)

Mons Veneris and Labia Majora. The mons veneris is a flat protuberance over the symphysis pubis, consisting of fat and connective tissue, covered by a tough skin hidden by coarse hair.

The labia majora are two folds of skin containing fat, connective tissue, and involuntary muscle fibres. They are continuous with the

mons veneris in front, and unite together behind about one inch in front of the anus. Their points of union in front and behind are known as the anterior and posterior commissures. Just within the posterior commissure is a crescentic transverse fold of skin—the fourchette. The region between these last-named structures is known as the fossa navicularis.

The Labia Minora or Nymphæ. Just below the anterior commissure of the labia majora the nymphæ begin on each side as two folds of

FIG. 1.

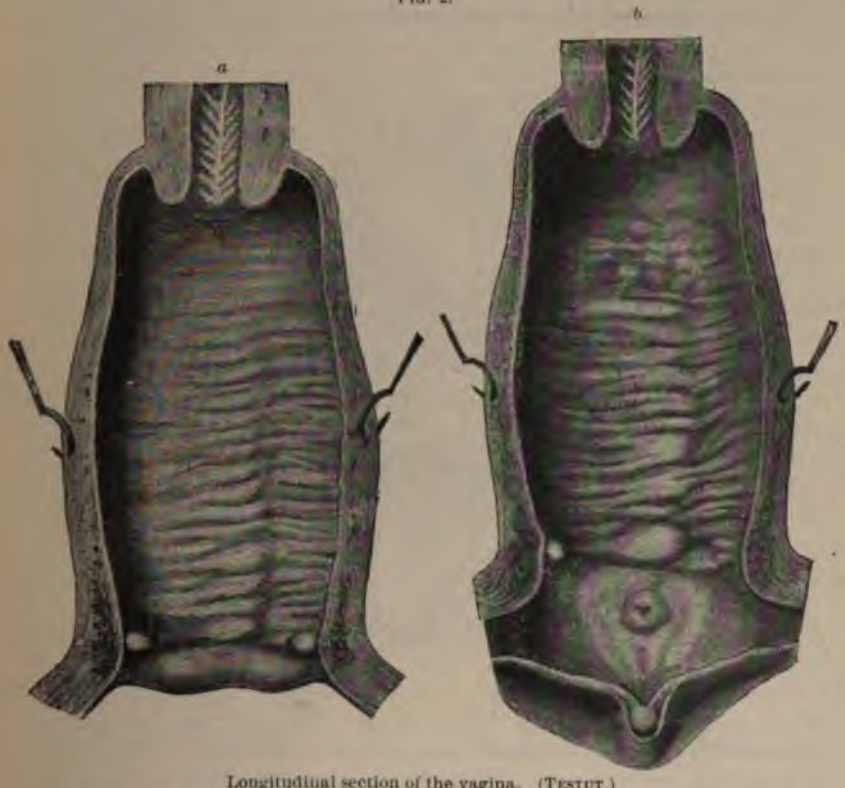
External genitals of a virgin with diaphragmatic hymen. *a*. Labium majus. *b*. Labium minus. *c*. Præputium clitoridis. *d*. Glans clitoridis. *e*. Vestibule just above urethral orifice. *f*. Mons veneris. (After SAPPEY.)

delicate skin. The upper one unites with its fellow on the opposite side to form the prepuce of the clitoris, while the others join in the median line and form the frænum of the prepuce. These folds unite on the outer side of and below the clitoris and run backward, becoming merged in the labia majora at about their middle or lower third. They are opposed to each other in the middle line, and in the Caucasian races are usually completely hidden by the labia majora. In different races, however, their size varies extremely. The skin which

covers them is in the transition stage between skin and mucous membrane, and it is continuous on either side with the delicate skin of the inner surface of the labia majora and with the mucous membrane of the vestibule. The internal structure of the nymphæ resembles connective tissue.

The Vestibule. The vestibule is the space between the clitoris, nymphæ, and vaginal orifice. The urethral orifice—the external

FIG. 2.



Longitudinal section of the vagina. (TESTUT.)

a. Segment showing posterior wall. b. Segment showing anterior wall.

meatus—enters it in the middle line. The bulbs of the vestibule are two masses of venous plexuses, about an inch long, lying behind the clitoris and within the nymphæ. They correspond to the corpora spongiosa in the male. They are sometimes lacerated during difficult deliveries, and may cause serious hemorrhage.

The Clitoris. The clitoris resembles the penis in miniature in its structure and in its main anatomical features. It is modified by the cleft below, by the absence of the urethra, and by the separation of

the corpora spongiosa into the bulbs of the vestibule. It is a slightly erectile organ. The glans of the clitoris is surrounded at its base by sebaceous follicles secreting a smegma which is very liable to decompose and to cause irritation.

The Hymen. The crescentic septum which usually occludes the posterior portion of the vaginal orifice is known as the hymen. Although usually crescentic, it may be annular, cribriform, or cordiform in shape. It consists of a reduplication of the mucous membrane, reinforced by fibrous tissue. It is usually delicate, and is ordinarily ruptured with ease at the time of the first coitus. It may,

FIG. 3.

Longitudinal section of the body, showing relation of generative organs. (PLAYFAIR.)

however, be occasionally so tough and resistant as to escape rupture and oppose an efficient obstacle to delivery at the time of labor. It is always partially destroyed by the pressure to which it is subjected during labor, the remnants being known as the carunculæ myrtiformes.

The Vagina. The vagina is a musculomembranous canal, extending from the hymen to the base of the vaginal portion of the cervix uteri. Its posterior wall is about 9 cm. (3.5 inches) long, the anterior 6.5 cm. (2.5 inches). The axis of the vagina is slightly sigmoid in direction, but corresponds fairly closely to the axis of the pelvic canal. At its upper portion it expands into the vaginal vault,

two well-marked cul-de-sacs being formed—the anterior and posterior fornices. The walls of the vagina are composed of three layers—the mucous membrane, the muscular layer, and the fibrous sheath. The muscular coat consists of two layers of muscular fibres, the inner of which has a circular and the outer a longitudinal arrangement. The anterior and posterior walls are ordinarily in contact, while the lateral walls are thrown into folds, giving the canal on cross-section the shape of the letter H. (Figs. 2 and 3.)

The mucous membrane consists of squamous epithelium, and has no glands except a few tubular structures in the upper part of the canal. The mucous membrane is thrown into numerous transverse folds or rugæ, most marked upon the anterior wall and in nulliparous women. The anterior and posterior walls both show median thickenings, composed of fibrous tissue which strengthens them, and for this reason lacerations which occur at the time of labor deviate to one or the other side of the median line, *i. e.*, follow the line of least resistance, and seldom extend straight up either vaginal wall. Although the vaginal mucous membrane contains few glands, the whole mucous membrane pours out an acid secretion. This is much increased during pregnancy, and not only lubricates the canal for the passage of the child, but also seems to have a distinct germicidal action, and probably in normal conditions aids materially in the prevention of septic infection.

The Uterus. The uterus is a hollow, muscular organ, which in the adult virgin measures 7.5 cm. (3 inches) in length, 4 cm. (1.6 inches) in breadth, and 2.5 cm. (1 inch) in thickness. In shape it is a flattened, pyriform body, the anterior wall being perfectly flat and the posterior more convex. It is divided into the body and neck, or cervix, the two being separated by what is called the isthmus. The first occupies about three-fifths of its length and the last two-fifths. In structure it may be described as a hollow muscle, lined with mucous membrane and covered with peritoneum. The muscle is unstriated, and is roughly divided into three layers—an external, middle, and internal. The middle layer constitutes the bulk of the uterine wall. Its fibres are arranged in a somewhat spiral form, but follow no very definite law. The mucous membrane of the body of the uterus is composed of ciliated, columnar epithelium, resting upon a delicate basement membrane. As there is no submucosa, the mucous membrane rests directly on the muscular tissue. The mucous membrane of the uterus is richly supplied with tubular glands. The epithelial lining of the cervix corresponds in structure in its upper two-thirds with that of the uterine cavity, and in its lower third with that of the vagina. In addition to the glands of the uterine body the cervical mucous membrane is studded with wide mucous crypts, whose mouths become easily obstructed, giving rise to retention cysts (Nabothian follicles). In the cervix the mucous membrane is thrown

into longitudinal folds with lateral branches—the "arbor vitæ" of the old anatomists.

The uterine cavity is normally fusiform, widened at its upper part into a triangular space. The most contracted portion is at the level of the internal os uteri. It has three openings, the internal os communicating with the cervical canal and the uterine orifices of the Fallopian tubes. In the nulliparous woman the cervical canal is a slender ovoid in shape, contracted at its upper and lower extremities—the internal and external ora uteri. In a woman who has borne children the cervical canal is often funnel-shaped, the most expanded

FIG. 4.

Transverse section of the body, showing relations of the fundus uteri. *m*. Pubes. *a a* (in front). Remainder of hypogastric arteries. *a a* (behind). Spermatic vessels and nerves. *B*. Bladder. *I L*. Round ligaments. *U*. Fundus uteri. *t t*. Fallopian tubes. *o o*. Ovaries. *r*. Rectum. *g*. Right ureter, resting on the psoas muscle. *c*. Uterosacral ligaments. *v*. Last lumbar vertebra. (PLAYFAIR.)

portion being at the external os or just above it. The cervix is divided into two portions, the vaginal and the supravaginal. The former projects into the vaginal vault; the latter is in relation to the subvaginal tissues, and extends a short distance above the vaginal walls, ending at the level of the internal os. (Figs. 5 and 6.)

The normal position of the uterus is almost horizontal when the woman is in the erect position. The uterus is held in place by various musculofibrinous bands and folds of peritoneum which radiate from the fundus in all directions, lying between the folds of peritoneum which are known as the broad ligament. It is freely movable, and rises and falls with every breath of the patient.

Owing to its development from the Müllerian ducts of the fœtus the uterus is liable to any of the malformations which may arise from a failure of their development.

The Fallopian Tubes. The oviducts, or Fallopian tubes, are tubular structures, about 10 cm. to 12 cm. in length, running from the cornua of the uterus, at first upward and outward along the upper edge and between the layers of the broad ligament, and at their outer extremities downward and backward to the free surface of the ovary. The lumen of the tube begins in the uterine wall as a very small opening, the ostium internum. It expands to a diameter of about 2 mm., widens as it runs outward, contracts as it passes the ovary, and expands again into a distinct opening, 4 mm. in diameter, the ostium

FIG. 5.

FIG. 6.

FIG. 5.—Transverse section of a nulliparous uterus. (PARVIN.)

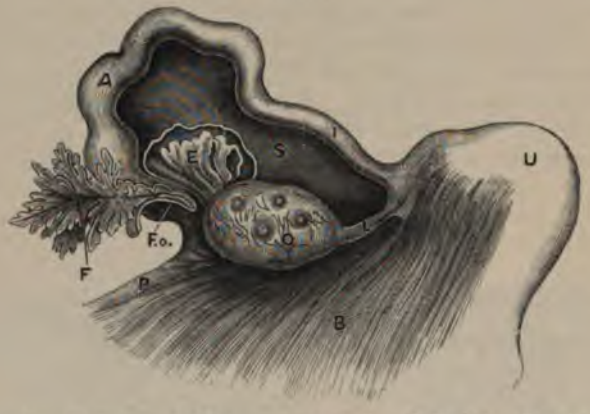
FIG. 6.—Transverse section of a multiparous uterus. *A*. Cavity of the neck and arbor vitæ. *C*. Cavity of the body. *O*. Isthmus separating body and neck. *S*. Uterine tissues. (PARVIN.)

abdominale, at the apex of the infundibulum—a funnel-shaped expansion surrounded by fimbriæ. The fimbriated extremity is connected with the ovary by the tubo-ovarian ligament. The tube has three coats—the mucous, muscular, and serous. The mucous membrane is composed of a single layer of columnar ciliated epithelium, whose cilia lash toward the uterine cavity. It is thrown into deep longitudinal folds which become more complex toward the fimbriated extremity. It contains no glands. The muscular coat consists of circular fibres of unstriped muscle, with an outer, poorly developed, longitudinal layer of fibres. The serous covering is the peritoneum of the broad ligament. From an obstetrical stand-point the tubes are principally important because they convey the ovum to the uterus. In some pathological conditions the ovum may become impregnated

and lodge in the tube, giving rise to the condition known as ectopic gestation. (Figs. 7 and 8.)

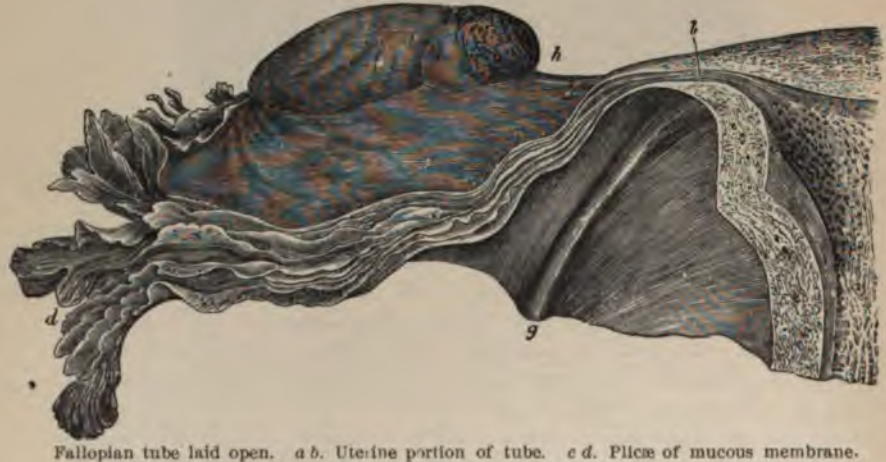
The Ovaries. The ovaries are almond-shaped bodies lying on the posterior surface of the broad ligaments, to which they are attached

FIG. 7.



Fallopian tubes. U. Uterus. I. Isthmus. A. Ampulla. F. Fimbriæ. F.o. Fimbria ovarica. S. Mesosalpinx. O. Ovary. L. Ligament of the ovary. P. Ligamentum infundibulo-pelvicum. E. Parovarium. (HENLE.)

FIG. 8.



Fallopian tube laid open. *a b*. Uterine portion of tube. *c d*. Plicæ of mucous membrane. *e*. Tubo-ovarian ligaments and fringes. *f*. Ovary. *g*. Round ligament. (After RICHARD.)

by their anterior borders. The ovary is a gland secreting eggs, and has, therefore, the structure of a gland—stroma, parenchyma, and gland spaces. It has, however, certain peculiarities. Its peritoneal covering exhibits a modified layer of cells—the germinal epithelium

—and the gland spaces are ductless and discharge their contents by rupture of their walls.

The function of the various internal organs of generation may be briefly described to advantage in this connection. The ovum is developed in the ovary and is set free by the rupture of the wall. Under normal circumstances it then passes down the tube into the uterus. The uterus is the organ in which the impregnated ovum develops until maturity is reached, when it assumes the rôle of expulsor, and by the contraction of its muscular fibres forces the products of gestation through the vagina and pelvis into the world.

THE PELVIS.

From an obstetrical stand-point the pelvis is to be considered only as a canal through which the child must pass in order to be born, and only such of its features as bear relation to this function will be discussed here.

FIG. 9.

Brim of pelvis, showing antero-posterior (C V), oblique (D), and transverse (T) diameters. (PLAYFAIR.)

The pelvis is made up of four bones. Its posterior wall is formed by the sacrum and coccyx, and the lateral and anterior walls by the two innominate bones, which articulate with the sacrum behind and with each other in front. These four bones form four articulations with each other, with true synovial membranes, supporting ligaments, etc. Under normal conditions there is little or no motion between the bones, but under the influences of pregnancy the amount of mobility in the joints becomes much increased, so that at the time of labor the shape and size of the pelvis may be more or less modified by the play between the bones. (Fig. 9.)

The sacrum articulates with the coccyx at its lower angle, and with the two innominate bones at each side. The innominate bones artic-

ulate with each other in the median line in front, the articulation being known as the symphysis pubis.

Under ordinary circumstances the sacrococcygeal articulation is the most important obstetrically, for the degree of mobility which normally exists in this joint at the time of labor materially enlarges the outlet of the pelvis, but it is only in patients in whom ankylosis of this joint has occurred, with consequent loss of mobility of the coccyx, that its true importance becomes evident. (Fig. 10.)

In most cases the mobility in the symphysis pubis is of slight importance, but in a few cases it becomes pathologically increased, and the patient is practically crippled by the loss of pelvic support which ensues.

The sacro-iliac articulations permit a degree of flexion and extension of the pelvis on the spine which is sometimes of importance. Under

FIG. 10.

Outlet of pelvis. (PLAYFAIR.)

normal conditions there is comparatively little lateral motion in the sacro-iliac articulations, but in cases in which separation of the symphysis pubis occurs, either natural or operative, the two sides of the pelvis swing apart to a limited extent, but yet sufficiently to materially enlarge the oblique diameters of the pelvis. This fact is used to great advantage in symphysiotomy, but the class of cases to which this operation is applicable is limited by the amount of mobility which exists in the sacro-iliac joints. The indications for and against this operation will be considered later.

The shape of the pelvis as a whole is that of an inverted, truncated cone bent upon its axis in an antero-posterior direction, and slightly compressed from before backward. The space enclosed by it is divided into two parts—the true and the false pelvis—by a plane which passes through the middle of the sacral promontory behind,

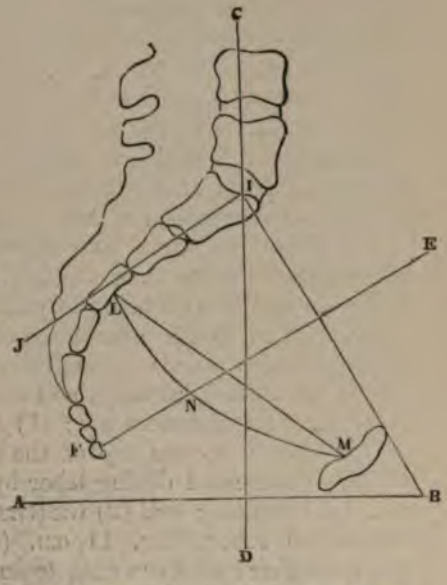
through the top of the symphysis pubis in front, and corresponds laterally to the iliopectineal ridges.

The True Pelvis. It is with the true pelvis that we are particularly interested. The true pelvis is a short, curved canal, roughly cylindrical in shape, and separated from the false pelvis by the plane above mentioned, which is known as the brim, inlet, or superior strait.

FIG. 11.

Section of pelvis showing the diameters. (PLAYFAIR.)

FIG. 12.



Planes of the pelvis with horizon. A B. Horizon. C D. Vertical line, A B I. Angle of inclination of pelvis to horizon, equal to 60°. B I C. Angle of inclination of pelvis to spinal column, equal to 150°. C I J. Angle of inclination of sacrum to spinal column, equal to 130°. E F. Axis of pelvic inlet. L M. Mid-plane in the middle line. N. Lowest point of mid-plane of ischium. (PLAYFAIR.)

The true pelvis forms the passage through which the child must pass to be born, and must be carefully studied, because variations in its size and shape, even though apparently insignificant, may determine the question of an easy or difficult delivery. The true pelvis consists of three principal divisions—the superior strait or inlet, the inferior strait or outlet, and the cavity or excavation of the pelvis, which lies

between them. The brim or inlet is slightly cordiform in shape, its general oval outline being encroached on along its posterior border by the promontory of the sacrum. It is bounded by the edges of the plane which divides the true from the false pelvis, as enumerated above. (Fig. 11.)

Superior Strait. It is customary to describe the superior strait by means of certain conventional diameters, which are: (1) The antero-posterior, or conjugate, from the middle of the sacral promontory to the middle of the upper border of the symphysis pubis, the normal length of which is 11.5 cm. (4.75 inches); (2) the transverse diameter, or the greatest distance between the iliopectineal lines, which measures on the average 13.5 cm. (5.75 inches); (3) the oblique diameters, or the distance from the point where each iliopectineal line touches the sacro-iliac articulation to the opposite pubic spine; their length should be 12.75 cm. (5.25 inches). These measurements are taken from the bony skeleton, and during life must be considered as shortened from 1 to 1½ cm. by the encroachment of the soft parts. Any marked diminution in these diameters will result in delay of the presenting parts at the brim during labor or in some alteration of the normal mechanism of labor. (Fig. 12.)

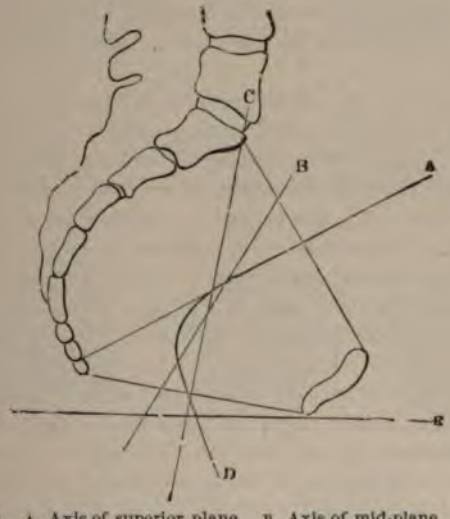
Inferior Strait. The inferior strait or pelvic outlet, while less regular in shape than the inlet, is more or less roughly ovate in form, the smaller end being forward. The larger end is more or less encroached on by the prominence of the coccyx. It is bounded by a plane which passes through the tip of the coccyx posteriorly, the ischial tuberosities laterally, and the lower border of the symphysis in front. Its diameters are: (1) The antero-posterior, from the tip of the coccyx to the top of the subpubic arch, 9 cm. (3½ inches), which is increased during labor by the mobility of the coccyx to 11 cm. (4.3 inches); and (2) the transverse, or the distance between the ischial tuberosities, 11 cm. (4.3 inches). Narrowing at this point, whether actual or owing to ankylosis of the sacrococcygeal joint, may cause delay in delivery.

The two straits are the most important pelvic planes, but there are two others worth noting. These may be called the planes of greatest and least pelvic expansion. The plane of greatest pelvic expansion passes through the union of the second and third sacral vertebræ posteriorly, through the mid-points of the acetabula laterally, and the middle of the symphysis anteriorly. Its diameters are: (1) Antero-posterior, 12.75 cm. (5.25 inches); (2) transverse, 12.5 cm. (5 inches). The plane of least pelvic expansion passes through the sacrococcygeal articulation posteriorly, the ischial spines laterally, and the lower third of the symphysis anteriorly. This is the narrowest part of the pelvic canal, and therefore it is the true obstetrical outlet. Its diameters are: (1) The antero-posterior, from the end of the sacrum to the summit of the subpubic arch, 11 cm. (4.3 inches);

(2) the transverse, between the ischia, near their posterior border, 11 cm. (4.3 inches); and (3) the distance between the ischial spines (the bis-ischiatic diameter), 10.5 cm. (4.2 inches). This plane may be of importance, because delay or arrest of the descending head may take place here after the brim has been safely passed.

EXCAVATION. The excavation of the pelvis may be described as an irregular cylinder of varying dimensions, bounded by the smooth surfaces of the surrounding bony parts. The anterior wall is formed by the bodies of the pubic bones and the symphysis; it is convex in outline, and is much shorter than the concave posterior wall, averaging 4 cm. (1.6 inches) in length, while the posterior wall, which is formed by the sacrum and coccyx, averages 11.5 cm. (4.5 inches). The lateral walls are formed by the bodies of the ischia.

FIG. 13.



Axes of the pelvis. A. Axis of superior plane. B. Axis of mid-plane. C. Axis of inferior plane. D. Axis of canal. E. Horizon. (PLAYFAIR.)

Position of the Pelvis. The position of the pelvis varies with the position of the body. In the erect position the plane of the inlet is at an angle of about 55 degrees, and the plane of the outlet at an angle of about 10 degrees with the horizontal. The axis of the superior strait thus points forward and upward, and corresponds closely with a line drawn from the tip of the coccyx to the umbilicus. The axis of the inferior strait points downward and slightly forward. If it were prolonged upward it would strike the promontory of the sacrum. The axis of the pelvic canal as a whole is a curved line joining the mid-points of the various pelvic planes. Whatever passes through the pelvic canal must, therefore, describe a curve around the

symphysis as a centre, which has long been known as the curve of Carus. (Fig. 13.)

It has been demonstrated beyond question within recent years that the position of the pelvis in flexion or extension has a distinct influence on the pelvic diameters. If the inclination of the pelvis to the spine is increased by extreme extension of the pelvis to the limit allowed by the mobility of the sacro-iliac joints the conjugate diameter of the brim, and therefore the oblique diameters through which the presenting head must pass, is distinctly increased; while if, on the other hand, the inclination of the pelvis is diminished by flexion the diameters of the brim are diminished and those of the outlet are increased. These facts probably explain the undoubted clinical fact that a woman in labor instinctively assumes in the early part of labor a position which produces extension of the pelvis, and thus favors the entrance of the presenting part into the brim; while at the beginning of the second stage of labor she as naturally assumes the doubled-up posture, which tends to flex the pelvis, and thus open up the diameters of the outlet.

The advantages to be derived in high operative work from the increase gained in the diameters of the brim were first described by Walcher, from whom the position of extreme pelvic extension now commonly employed in high operative deliveries takes its name.

The False Pelvis. The false pelvis, which lies above this plane, has no obstetrical importance beyond the fact that its walls support the contents of the abdominal cavity, of which it forms a part, and as they slope toward the inlet of the true pelvis, serve to guide the presenting part of the fœtus toward the true pelvis at the time of labor.

The majority of the measurements given above cannot be obtained on the living woman, but experience has shown that there are certain external measurements of the false pelvis which can be easily obtained, and which give indications of value about the internal pelvic diameters. The most important of these are the following: The distance between the anterior superior spines, 25 to 26 cm. (10¼ inches); the distance between the widest points of the iliac crests, 28 to 29 cm. (11.5 inches); and the external conjugate—*i. e.*, from the spine of the last lumbar vertebra to the upper border of the symphysis pubis—20 cm. (8 inches). The other external measurements which may be taken with advantage are: (1) The oblique diameters—*i. e.*, from one anterior superior spine to the opposite posterior superior spine—22 cm. (8.8 inches); (2) the distance between the femoral trochanters, 30 to 31 cm. (13.5 to 14 inches); and (3) the distance between the ischial tuberosities, 10.5 to 11.5 cm. (4.35 to 4.75 inches). Any marked variation from these normal external measurements indicates an approximate variation in the internal diameters. In the average case the thickness of the bones and the soft parts is fairly constant.

CHAPTER II.

THE DEVELOPMENT OF THE OVUM.

In order to clearly understand the abnormalities which may occur in the development of the fœtus it is necessary to study briefly the development of the ovum from the time of its impregnation up to its maturity. The careful study of the changes which the developing ovum undergoes would require a text-book in itself, and our intention in this brief section is merely to recapitulate the main embryological points which are of obstetrical interest, referring the student who wishes a deeper knowledge of the subject to the text-books on embryology.

IMPREGNATION.

After the occurrence of ovulation the ovule leaves the ovary and passes downward through the Fallopian tube toward the uterus. At

FIG. 14.

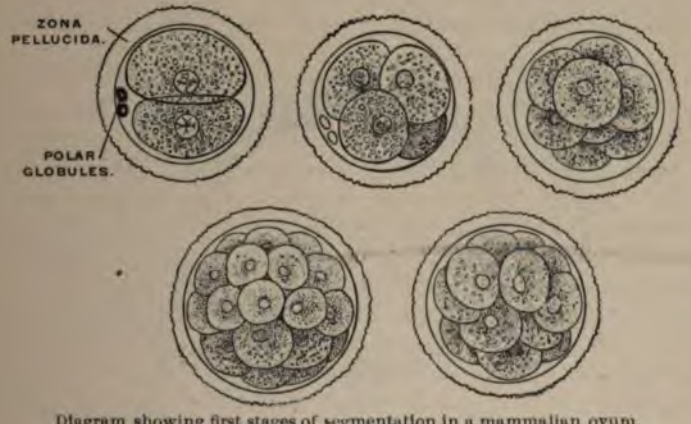
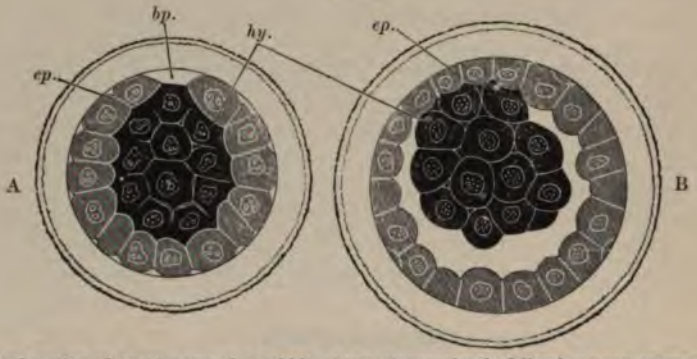


Diagram showing first stages of segmentation in a mammalian ovum.
(ALLEN THOMPSON after E. VAN BENEDEN.)

some point in its course it meets the male element, or spermatozoön, and impregnation occurs. It is generally assumed that the ampulla of the tube is the most common meeting-place, and that impregnation may occur here is conclusively proved by cases of tubal pregnancy; but there are strong arguments in favor of the fundus uteri as the common place of impregnation. If menstruation and ovulation are

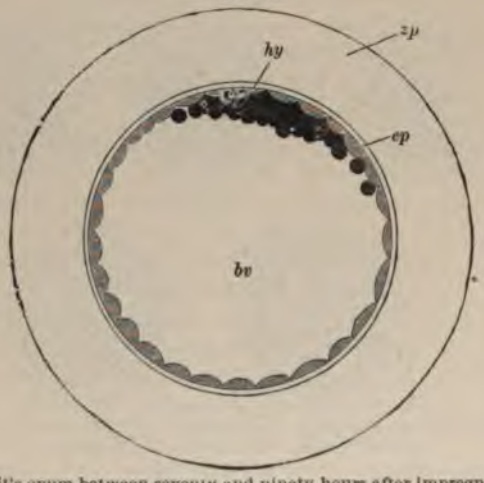
coincident, it is probable that the ovule must reach the uterus before the fruitful coitus occurs, and that impregnation takes place in the uterus; but as the time of ovulation is uncertain in the human race, it seems probable that the place of impregnation is also uncertain. For the present we must assume that either situation is possible.

FIG. 15.



Optical section of an oösperm of a rabbit, at two stages, closely following upon segmentation (from Balfour after E. v. Beneden). *ep*, Ectoderm. *hy*. Primary entoderm. *bp*. The opening in the ectodermic layer at one point, named blastopore by E. van Beneden; this is not a true blastopore. The shading of the ectoderm and entoderm is diagrammatic. (BARNES.)

FIG. 16.



Rabbit's ovum between seventy and ninety hours after impregnation.
(After E. VAN BENEDEN.)

From the circumstances of the case we have no knowledge of the process of fertilization in the human race, and the following statements are derived from direct observations made on the other mammalia. It seems probable that the ovule in its descent through the

tube excretes some material which attracts the spermatic particles. Of the numerous spermatozoa which surround the ovule several may penetrate its cell wall, but only one makes its way into the cell contents. The head of this spermatozoön fuses with a portion of the protoplasm of the ovum, and its tail disappears. The head then penetrates the cell contents and becomes the male pronucleus, which finally fuses with the female pronucleus or nucleus of the ovum. Conception occurs at the moment of this union, and the life of the fœtus begins. (Figs. 14, 15, and 16.)

Changes in the Ovum following Impregnation. This fusion of the male and female pronuclei results in the formation of the nucleus of segmentation, and the ovum at once begins to segment. It divides first into two cells, these into four, and so on until the whole ovum is surrounded by a layer of cells enclosing a group of somewhat larger cells, the morula, and a cavity containing albuminous fluid. When its development has reached this point the ovum is known as the blastodermic vesicle, or blastula. The next step is the arrangement of the cells of the ovum in a thinned-out, laminated layer around its periphery, which, with another layer just within, which is derived from the proliferating central mass of cells, forms the ectoderm, while the proliferating central mass itself forms the entoderm. On examination of the surface of the ovum at this time an oval, opaque region—the embryonal area—may be seen, in the middle of which a streak of greater opacity is apparent—the primitive streak. Along this streak a depression soon makes its appearance—the primitive groove.

A section from this region under the microscope now shows the development of a median layer of cells (the mesoderm), made up by cells derived partly from the ectoderm and partly from the entoderm. In its development the mesoderm forms lateral reduplications and parts into two layers (the parietal and visceral layers), enclosing between them a space, the body cavity, or cœlum. The parietal layer unites with the ectoderm and the visceral layer with the entoderm. At the end of the second week the development of the embryo proper begins, and the neural folds, the neural canal, the chorda dorsalis, and the provertebræ are formed. In a general way the normal development of the embryonal body now depends upon an arching over of cells which enclose the spinal canal, abdominal and thoracic cavities, and the cranial cavity. An arrest in these developmental processes results in such deformities as spina bifida, encephalocele, exstrophy of the bladder, etc.

THE DECIDUÆ

By the time the fertilized ovum arrives within the uterine cavity the mucous membrane of the uterus has become very much thick-

ened, owing to a great increase in the interglandular connective tissue. As a consequence the mucous membrane is thrown into folds, and it is in a depression between two of these folds of membrane that the ovum lodges, and being thus embedded in the mucosa it becomes gradually enclosed by the arching over of the folds on each side of it. That portion of the uterine mucous membrane on which the ovum rests is called the decidua serotina; the portion which covers it in is known as the decidua reflexa; and that portion which remains as before, attached to the uterine wall, is the decidua vera. As the ovum enlarges the decidua reflexa is brought into contact with the decidua vera.

Owing to the pressure the bloodvessels disappear, the endometrium atrophies and, except in the deeper portions, the glandular elements disappear. When labor begins the decidua vera splits along the line of the separation between the glandular and non-glandular layers, the latter being thrown off, while the former gives rise to the new endometrium. The decidua are liable to the same diseases and degenerations that the uterine mucous membrane is itself, and in the presence of any marked change in the decidua it is rare for pregnancy to persist uninterrupted, the usual result being a miscarriage or abortion.

FIG. 17.

FIG. 18.

FIG. 17.—Compound villus of chorion from a three months' fœtus. Magnified 30 diameters. (PARVIN.)

FIG. 18.—Human embryo at the third week, showing villi covering the entire chorion. (HAECKEL.)

THE CHORION.

When the ovum first drops into the uterine cavity and becomes embedded in the thickened endometrium its protoplasmic cell wall

sends out numerous prolongations which serve to fix the egg in its position and perhaps to draw nourishment from the bloodvessels of the uterine mucous membrane. This cell wall, with its villus-like projections, is known as the false chorion. It soon disappears, and is replaced by a single layer of cells which springs from the outer layer of the blastodermic membrane and surrounds the whole ovum. This membrane, in its turn, sends out villi, which are at first hollow, but non-vascular. They soon receive loops of bloodvessels which are brought to the periphery of the egg by the allantois, which now fuses with the original membrane and forms the permanent chorion. These vascular villi absorb nutriment from the whole extent of the decidua reflexa until the third month, when they atrophy and disappear, except at the portion of the periphery of the ovum on which the allantois implants itself, where they develop still further to form the placenta. (Figs. 17 and 18.)

THE AMNION.

After segmentation has taken place and the interior of the ovum has become reduced to a granular mass, surrounded by a membrane

FIG. 19.

FIG. 20.

FIG. 19.—*e*. Embryo. *ec*. Cephalic extremity. *eq*. Caudal extremity. *ce*. Amniotic hood. *pp*. Pleuroperitoneal cavity. *y*. Umbilical vesicle. (PARVIN.)

FIG. 20.—Completion of the amnion. *u*. Umbilical vesicle. *p*. Pedicle of the allantois. *a*. Amniotic cavity. (LEISHMAN.)

composed of a single layer of cells, there appears a thickening (the embryonal area), caused by a heaping up of cells in a portion of this membrane. As already described, this mass of cells resolves itself into the ectoderm and entoderm, and the mesoderm is developed between them. (Figs. 19 and 20.)

By cell proliferation the ectoderm sends an extension, which receives a reinforcement from the mesoderm, around the whole interior sur-

face of the ovum. At this time the embryo begins to assume a definite shape; the lateral walls begin to fold in toward one another; and the caudal extremity of the embryo slightly approaches the cephalic end, producing the arched-back appearance characteristic of the young embryo. The outer layer of cells, which forms a membrane continuous with the outer covering of the embryo, instead of being simply carried forward to meet in the median line in front, sends reduplications backward over the dorsal aspect of the embryo, which soon unite. There are consequently two cavities formed, one within the reduplicated membrane, and the other—the true amnion—between the inner of the two layers of membrane and the outer covering of the embryo. The latter forms the true amniotic cavity. It becomes more and more distended by the accumulation of fluid until its limiting membrane is pushed out on all sides, uniting in front around the umbilical cord and coming in contact throughout the whole circumference of the ovum with the outer membrane (chorion), to which it becomes loosely united by a gelatinous substance—the tunica media of Bischoff.

The amnion is the innermost of the membranes which surround the fœtus at term. It is continuous with the fœtal epidermis at the umbilicus, forms a complete sheath for the umbilical cord, and covers the fœtal surface of the placenta. It contains no bloodvessels in its normal condition, at least in its fully developed state.

THE LIQUOR AMNII.

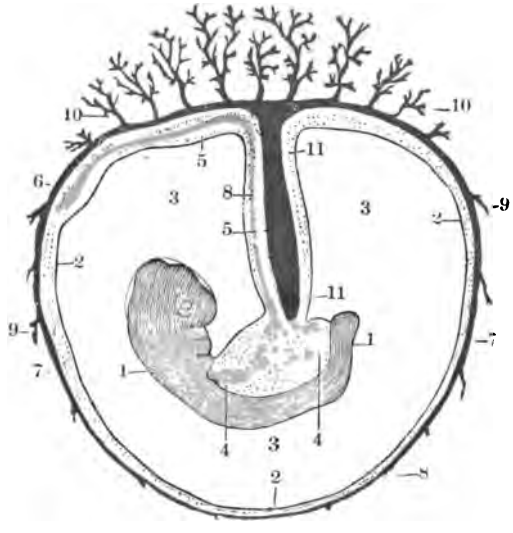
The function of the amnion is to furnish a fluid medium (the liquor amnii), which, by distending the uterine walls, allows the fœtus some freedom of motion. It helps to protect the fœtus from external violence, pressure, and changes of temperature. It receives the urine secreted in the latter part of fœtal life, and, according to some authors, may play a certain part in the nourishment of the fœtus, for it has been proved beyond question that the fœtus swallows considerable quantities of it. It is derived in part from maternal secretion and in part from fœtal excretion. Its quantity normally is between one and two pints.

THE UMBILICAL CORD.

During the first few days of its development the embryo receives its nourishment from the umbilical vesicle; but as this structure disappears early in fœtal life and leaves practically no traces, it need only be mentioned here. (Plate I.)

From about the time when the ovum first arrives in the uterine cavity it derives its chief nourishment from the mucous membrane of that organ; at first by simple absorption through its walls, and later

PLATE I.



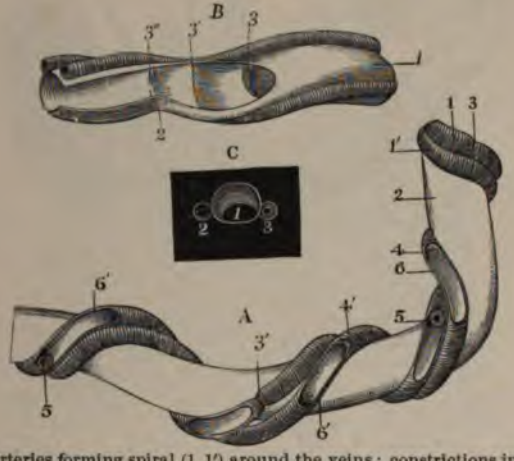
Evolution of the Placenta and of the Umbilical Cord.
(From Sappey.)

1, 1. Embryo.
2, 2, 2. Amnion.
3, 3, 3. Cavity of Amnion.
4, 4. Digestive Canal.
5, 5. Pedicle of the Umbilical Vesicle.
6. Umbilical Vesicle.
7, 7. Allantoid Vesicle.
8. Pedicle of the Allantois.
9, 9, 9. Chorial Villi beginning to atrophy.
10, 10. Villi in relation with the utero-placental decidua, which hypertrophy.

through the placenta, when that organ is finally developed—*i. e.*, at the end of three months.

The first step in the establishment of the permanent organ by which the fœtus is to receive its nourishment during the remainder of its intra-uterine life is the formation of the allantois, by means of which a connection is established between the embryo and the villi of the chorion. This begins at a very early period of fœtal life as a sac-like projection from the posterior extremity of the intestine. It soon becomes vascular and increases rapidly in size. In the course of the third week it reaches the chorion, over which it spreads and forms a complete vascular lining, its vessels penetrating into the villi of the chorion, with which it becomes permanently fused. The point at

FIG. 21.



A. Umbilical arteries forming spiral (1, 1′) around the veins; constrictions indicating the presence of folds (5, 5′); lateral openings showing the arterial walls. *B*. Vein opened upon the side, showing a constriction (2) corresponding to an interior valve (3″); semilunar valves (3, 3′, 3″). *C*. Section of vein and arteries, showing valve of vein (1), a semilunar arterial valve (2), and a circular arterial valve (3). (TARNIER and CHANTREUIL.)

which the allantois first touches the chorion determines the site of the future placenta, and the villi of the chorion increase in size and number at this point, while they gradually disappear over the rest of its surface. The vessels of the allantois at first consist of two veins and arteries, but one of the veins subsequently atrophies, so that the permanent circulation is reduced to one vein and two arteries. (Fig 21.)

As the amnion becomes expanded to come into contact with the chorion it forms a reflection around the pedicle of the allantois like the finger of a glove, and the formation of the umbilical cord begins. The structure of the cord is finally completed by the development of a peculiar gelatinous substance, the gelatin of Wharton, which is

FIG. 22.

Twisted cord. (From SCHAUTA.)

FIG. 23.

Apparent constriction of bloodvessels of cord, from absence of Wharton's jelly. (PARVIN.)

derived from the outer layers of the chorion and allantois, and which serves as a protection to the bloodvessels.

The fully developed cord consists of the pedicle of the allantois, containing two arteries and one vein, of the sheath derived from the amnion, and of the gelatin of Wharton. The arteries convey dark, venous blood to the placenta, loaded with the products of fœtal excretion, and the vein brings back bright, oxygenated blood. At term the average umbilical cord measures about twenty inches in length, and from the fact that the arteries are coiled spirally around the vein it has a twisted appearance. The length varies extremely in different cases. Its practical absence has been reported on the one hand, and

FIG. 24.

Section of a portion of a fully-formed placenta, with the part of the uterus to which it is attached. *a*, Umbilical cord. *b b*, Section of uterus, showing the venous sinuses. *c c*, Branches of the umbilical vessels. *d d*, Curling arteries of the uterus. (LEISHMAN.)

a length of seventy inches on the other. The cord becomes so twisted that the umbilical vessels are practically obliterated. This is usually regarded as a postmortem condition resulting from the extreme mobility of the dead child in the uterine cavity rather than as the cause of death of the child. (Figs. 22, 23, and 24.)

In some cases the fœtus slips through a loop in the cord and ties a knot in it. This may be repeated and a double knot tied, but the fœtal circulation is seldom interfered with.

The cord is usually attached near the centre of the placenta. As the insertion approaches the edge of that organ the condition receives the name of marginal or battledore placenta.

THE PLACENTA.

The placenta as a separate organ dates from the third month of pregnancy. At this time the villi of the chorion atrophy, except at the point where the allantois implants itself. Here the villi take on an extraordinary growth, forming buds of epithelial cells upon their surface, which rapidly form new villi. Branches are then thrown out in every direction, each containing a bloodvessel. Separating the villi from one another and dipping down to the base of the chorion

FIG. 25.

Velamentous insertion of the cord. (PARVIN.)

between the parent stems of the villous projections are tuft-like processes of the decidua, carrying capillary loops of the maternal bloodvessels. Early in the history of the ovum the arterioles of this system open directly into the intervillous spaces of the placenta, so that the placental villi are bathed directly in the maternal blood. Later, large sinuses are developed, into which the uterine arteries and veins open and into which the placental villi project. There is thus no direct connection between the maternal and fœtal circulation, but

the villi are constantly bathed in the maternal blood, from which they absorb the necessary nourishment for fœtal growth by osmosis. This mass, made up of the proliferating fœtal villi and the maternal tufts, forms that organ known as the placenta, which at term is a circular mass about seven inches in diameter and from two-thirds of an inch to an inch in thickness at the point of insertion at the cord. Its weight is about sixteen ounces. (Fig. 25.)

Upon the fœtal surface of the placenta—*i. e.*, the surface into which the cord enters—it is covered by the amnion, which is continuous with the sheath of the cord. (Figs. 26 and 27.)

FIG. 26.

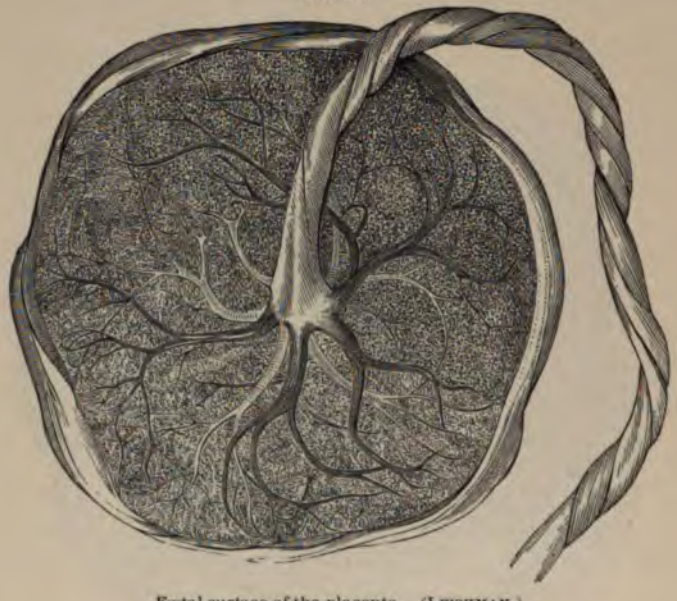
Maternal surface of the placenta. (LEISHMAN.)

The maternal surface is dark red in color, and is divided into lobules (the cotyledons) of irregular outline by deep sulci. Over the maternal surface of the placenta is stretched a delicate, grayish, transparent membrane which is made up of the cells that compose the upper layer of the decidua serotina. This constitutes the maternal portion of the placenta. In the separation of the placenta from the uterine wall the line of separation does not divide the fœtal from the maternal structures, but is found in the mucous membrane of the uterus. The ordinary situation of the placenta in the uterus is upon

either the anterior or the posterior wall. It may be implanted on one of the lateral walls, more frequently the right. It is usually situated near the fundus uteri. A low insertion gives rise to the condition known as placenta prævia, which will be fully described later.

The size of the placenta may vary considerably. Its thickness bears an inverse ratio to its extent, and the younger the ovum the greater the relative size of the placenta. In rare cases it has been known to extend over the whole surface of the ovum. An abnor-

FIG. 27.



Fœtal surface of the placenta. (LEISHMAN.)

mally small placenta may be associated with a poorly developed child. The placenta is usually circular or oval in shape, but it may have a horseshoe or crescentic form, especially in cases of low attachment. In multiple pregnancy each child has its own placenta, but they may be more or less fused together. A single child may have two or more placentæ, or a single placenta may be reinforced by one or more small accessory placentæ (placentæ succenturiatæ).

CHAPTER III.

THE DEVELOPMENT OF THE EMBRYO AND FŒTUS.

THE changes in the developing embryo and fœtus that mark its growth from month to month are of practical value to the obstetrician when he would determine the age of a cast-off ovum, and the intelligent explanation of many congenital deformities and intra-uterine accidents and diseases also depends upon a knowledge of the normal processes of intra-uterine development.

FIRST MONTH.

We have little definite knowledge of the life-history of the human ovum in the early part of the first month. During the first month it is indistinguishable from that of other mammals. It may be described at this early period as a double-walled, flattened vesicle filled with fluid. The yolk-sac, which at first occupies nearly the whole ovum, is, even at the end of the first month, larger than the cephalic extremity of the embryo. The visceral arches are distinct. The limbs are merely rudimentary. The cord is straight, thick, and short. The amnion is still quite close to the embryo, and is separated from the chorion by a clear space. The heart appears first as a cylindrical body, which soon becomes S-shaped, and by the fourth week it displays four cavities and is covered by the pericardium. The brain and spinal column are enclosed. The intestinal tract is also closed over, but the connection with the umbilical vesicle is still a wide one. The first trace of a liver appears, and primitive kidneys may be seen. Toward the end of this time the eyes may be distinguished at the sides of the head, and the rudimentary extremities appear as four bud-like processes.

SECOND MONTH.

At the beginning of the second month the ovum is the size of a pigeon's egg, and the embryo measures about 8 mm. (0.3 inch) in length. During this month the embryo grows to 2.5 inches in length, and the ovum reaches the size of a hen's egg. The visceral clefts close, with the exception of the first, which eventually forms the external auditory meatus, the cavity of the middle ear, and the

Eustachian tubes. The first visceral arch divides into two branches which form the superior and inferior maxillæ. The latter, one from each side, unite in the median line to form the lower jaw. The superior maxillary processes do not unite with each other, but with the frontal process which intervenes between them. Failure of this union results in harelip; but as union should always be perfect before the end of the second month the arrest of development which results in this deformity must have occurred before the third month. With the growth of the viscera the body becomes somewhat straightened out, and the head increases in size from the growth of the brain. The umbilical vesicle atrophies, and may be found attached to the body by a slender pedicle. The umbilical ring is somewhat contracted, but still contains a few loops of intestine. Failure in the development of the abdominal wall at this time would result in an umbilical hernia. The umbilical cord is still straight. The eyes are on the sides of the head, with the ears behind them. The limbs are separated into their three divisions, and the first suggestions of feet and hands appear, with the toes and fingers webbed. The kidneys and suprarenal capsules are developed. The sex is still indistinguishable. The rudiments of the eyelids appear. Points of ossification develop in the lower jaw and clavicle.

THIRD MONTH.

During this month the ovum reaches the size of a goose egg, 9.5 to 11 cm. (3.75 to 4.3) inches long, and the embryo grows to a length of from 7 to 9 cm. (2.75 to 3.5 inches). The umbilical cord increases in length and becomes twisted. The umbilical ring is smaller and the intestines are enclosed within the abdomen. The fingers and toes lose their webbed appearance, and the nails appear as fine membranes. The eyes approximate their normal position and are covered by the lids. Points of ossification appear in most of the bones, and the neck is differentiated. The sex becomes distinguishable by the presence or absence of the uterus. Cutaneous folds form a scrotum or labia majora, but the clitoris and penis are still of equal length in the two sexes. For the sake of completeness, it may be mentioned here that the placenta, though small, is plainly recognizable.

FOURTH MONTH.

In the fourth month the fœtus reaches a length of 10 to 17 cm. (4 to 6.75 inches). The umbilical cord is more twisted than formerly, and the placenta is increased in size. The head of the fœtus now amounts to about one-fourth the length of the whole. The cranial bones are partly ossified, though the fissures and fontanelles

still gape widely. The sex is now plainly distinguishable. The skin is covered with fine down (lanugo), and a few hairs are seen on the scalp. The intestines contain meconium. The limbs move feebly, and the fœtus, if born at this time, may live for a short time.

FIFTH MONTH

During this month the fœtus is from 18 to 27 cm. (7 to 10.5 inches) long, and weighs about eight ounces. The umbilical cord is about a foot in length. The weight of the liquor amnii exceeds that of the fœtus. The head is relatively very large, and the face has a senile look and is much wrinkled. The eyelids begin to open. The skin is covered with lanugo. Quickening is usually felt some time during this month, and the heart sounds may be heard in rare cases. If born at this time the fœtus may make efforts at crying, but it dies in a few minutes or, at most, hours.

SIXTH MONTH.

The length of the fœtus at this time is from 28 to 34 cm. (11 to 13.5 inches), and its weight averages about twenty-three and a half ounces. The skin is better supplied with fat, and the hairs of the scalp are longer. The eyebrows and eyelashes are distinct. The umbilical cord is inserted in the middle third of the body between the symphysis pubis and the ensiform cartilage. The head is still relatively large. In boys the testicles lie close to the inguinal rings. If born at this time the fœtus may live from one to fifteen days, but usually soon dies from loss of heat and inability to assimilate its food properly.

SEVENTH MONTH.

At the end of this month the length is from 35 to 38 cm. (13.75 to 15 inches) and the weight about eleven ounces. The whole body surface, except the palms of the hands and the soles of the feet, is covered with lanugo. The large intestine contains considerable meconium. The pupillary membrane, which has up to this time covered the pupil, now disappears. A fœtus born between the twenty-fourth and thirtieth weeks rarely survives.

EIGHTH MONTH.

The fœtus now measures in length from 39 to 41 cm. (15.25 to 16 inches) and weighs about three and a half pounds. The hair on

the scalp is more abundant, and the lanugo on the face is disappearing. In boys one of the testicles at least has descended into the scrotum. The nails are firmer, but do not yet project beyond the finger-tips. At the end of the eighth month ossification begins in the lower epiphyses of the femur. The cord is inserted a little below the mid-point between the ensiform and pubes. If a child born at this time receives proper care it has a good chance of life.

NINTH MONTH.

At this time the fœtus measures 42 to 44 cm. (16.5 to 17.25 inches) and weighs about four and a quarter pounds. The subcutaneous fat is much increased in amount. The nails are not yet perfectly developed. At the end of this period the weight will be about five and a half pounds, and the diameters of the skull will be from 1 to 1½ cm. less than at term. The bones are very compressible at this time, and are easily moulded. With ordinary care a child born at this time will live.

TENTH MONTH.

During the last four weeks of intra-uterine life the child is developing from the condition just described to that proper for a child at term.

THE MATURE FŒTUS.

No one sign enables us to declare a given fœtus mature, but the weight, length, and general development enable us to judge with fair accuracy the period of intra-uterine life which has been passed. At term a healthy fœtus should weigh on the average from seven to seven and a half pounds. Variations between six and nine pounds are sufficiently common to be perfectly normal. Outside of those limits the variation may be classed as abnormal, but extreme cases are reported on either side. The appearance of the infant is of value in indicating whether or not it had reached maturity before birth. A healthy infant at term looks stout and well nourished. The face is plump and free from lanugo. The eyes are usually open, the limbs move vigorously, and the child will suck anything put into its mouth. The nails project beyond the finger-tips. The cartilages of the nose and ears feel firm. The eyebrows and lashes are well developed. The hair of the scalp is about an inch long. The bones of the head are hard and lie close together. In boys the testicles are usually in the scrotum. In girls the labia majora are usually well developed, although occasionally the nymphæ project between them.

CHAPTER IV.

DIAGNOSIS OF PREGNANCY.

THE diagnosis of pregnancy during the earlier months is difficult and sometimes impossible, even when every opportunity to make a thorough examination has been given and all the resources of the specialist have been exhausted. After the third month, however, diagnosis becomes progressively more easy, until at term a mistake is rarely excusable except in the face of some complication. The signs on which a diagnosis of pregnancy is based may be divided into three classes—those obtained from the patient's history, from inspection of the exposed breasts and abdomen, and from abdominal and vaginal examination.

In all cases it is possible to obtain such information as can be gained from the patient's history and from ordinary inspection of the patient without deranging her clothing. This, however, is never sufficient for a positive diagnosis, as the rational signs of pregnancy are so well known to the laity, and the patient frequently has an object to gain by deception.

Vaginal and abdominal examination may afford the means of making a positive diagnosis in exceptional cases as early as the end of the eighth week, and the proof so obtained often becomes absolute by the end of the third month, especially if the physician is given the opportunity of making repeated examinations at regular intervals. The practice of this method of examination is rarely to be advised, unless the circumstances of the patient render an early diagnosis of great importance. Examination of the breasts and abdomen occupies a middle position between the other methods, both in value and in attainability. In the latter part of pregnancy, inspection, palpation, and auscultation of the abdomen, in addition to the evidence furnished by the breasts, usually allow the making of a positive diagnosis, and at this time such an examination can usually be obtained. In early pregnancy, on the other hand, this examination of the abdomen is apt to cause nearly as much opposition as a vaginal examination, besides being far from positive in its results. The physician's conduct, when a diagnosis is asked for, must vary, therefore, in regard to the social status of his patient and the stage of the supposed pregnancy. If consulted early in pregnancy by a married woman, who wishes to know for some reason or other whether pregnancy exists or not, it is seldom wise to propose a vaginal exami-

nation, but it is usually best to confine one's self to such evidence as can be obtained from the history of the patient and the examination of the breasts. It is necessary to give an extremely guarded opinion in all cases, because women who desire children are prone to accept the most cautious statement as a positive assurance, and nothing is more injurious to a physician's reputation than a supposed inability to diagnose the pregnant condition.

When, however, a patient asks for an opinion at a time when a positive diagnosis can be made by palpation—*i. e.*, after the sixth or seventh month—it is usually easy to obtain such an examination by reminding the patient that it is a distinct gain for her if the attendant be allowed to assure himself not only of the fact of her pregnancy, but of the position, presentation, and life of the child, as early as possible.

On the other hand, in the case of a patient whose unmarried condition or other circumstances make an early decision of great importance, the only wise course is to decline to express any opinion without a vaginal examination. The diagnosis of pregnancy is dependent on the coincident appearance of all or several of the symptoms of the condition rather than upon any one pathognomonic sign, and to determine the relative value of the signs it is necessary to consider them in detail.

HISTORY AND INSPECTION.

Amenorrhœa. One of the first signs which leads a patient to suspect her condition is the absence of the usual catamenial period, especially if the periods have previously been regular in their occurrence. Its value as a sign of pregnancy is impaired by the fact that cases have occurred in which apparently normal menstruation has persisted throughout pregnancy, and exceptional cases have been reported in which menstruation occurred only during pregnancy.

Amenorrhœa of two months or over, occurring in a patient who has previously been perfectly regular in her menstrual habits and who has been exposed to conception, is always strong presumptive evidence of pregnancy. The more common causes of amenorrhœa which are independent of pregnancy are change of climate, chlorosis, and anæmia, whether primary or secondary to some chronic wasting disease, as cirrhosis, tuberculosis, renal disease, etc. In women who are nursing or who are habitually irregular the evidence furnished by amenorrhœa is of no value. Other causes which sometimes account for the non-appearance of one or more catamenial periods are unusual fatigue or excitement, such as grief, overwork, or the onset of insanity. In newly married women the pelvic congestion due to the recently adopted marital relation may act as a cause, while in unmarried women who have been exposed, excessive fear of pregnancy apparently may cause a temporary amenorrhœa.

Nausea and Vomiting. An almost equally prominent symptom of pregnancy, and one equally well known to the laity, is the so-called morning sickness of pregnancy. This consists of nausea, occurring most commonly in the early morning when the patient first assumes the erect posture, accompanied or not by vomiting. This symptom is by no means a constant one, so that its absence is of slight importance, while its presence is only significant when it occurs in connection with amenorrhœa, in which case it is strongly suggestive of pregnancy if chlorosis, severe anæmia, and Bright's disease can be excluded. It may begin within eight or ten days after conception, but in most cases does not occur until the fourth or fifth week, and it is usually limited to the first three or four months of gestation. The etiology is unknown, and for want of more definite knowledge it is usually classed as a neurosis. In most cases it is comparatively mild and does not impair the patient's health seriously. It is, however, at times so severe and long continued that not only is part of the morning meal vomited, but all food taken at any time during the day is rejected, and the patient's general condition becomes seriously and even dangerously altered—a condition which, though symptomatic of pregnancy, is nevertheless pathological.

Salivation. Excessive salivation, coming on usually soon after eating, is another symptom often observed in early pregnancy. It is less common than nausea and vomiting, so that its absence is of less, while its presence is of about equal, importance.

Minor Digestive Disturbances. Heartburn, flatulency, and unpleasant eructations of gas sometimes occur. Abnormalities in appetite—*i. e.*, longings for unusual foods, as chalk, clay, slate-pencils, etc.—occur in some women, usually in those of a nervous type, and usually indicate a disordered nervous condition, though they at times serve as an indication of a patient's needs. Rarely patients are found who, far from being unpleasantly affected by pregnancy, experience a great improvement in appetite and digestion at this time. Many patients complain of obstinate constipation. Diarrhœa sometimes occurs, but is a much less frequent source of annoyance.

Breasts. A sensation of weight and fulness in the breasts, often accompanied by tingling sensations, is a more or less constant accompaniment of pregnancy. To the eye, especially in primiparæ, the breasts are seen to be larger and more developed than in the non-pregnant state, and the nipples are more prominent than formerly. Multiparæ sometimes dream in the early months that they are nursing a baby.

Quickening. Quickening, or the sensation of fœtal movements, is a sign of more or less value when taken in conjunction with other signs, but as this is a point on which women who desire children are peculiarly liable to deceive themselves, the patient's evidence on this point is inconclusive. The time of the first perception of fœtal

movements is rather variable, women of a sensitive nervous organization perceiving them earlier than women of a more phlegmatic temperament. As a rule, the sixteenth to the eighteenth week is the average time, though some are affected much later and some earlier.

Leucorrhœa. A more or less marked increase in the vaginal secretions almost always occurs in pregnancy, but it may be produced by so many other changes as to have little or no diagnostic value.

Sensations during Coitus. Certain women believe themselves able to designate accurately the fruitful coitus by their perception during the connection which they believe to have been eventful of certain peculiar, voluptuous, or other sensations which they have never felt at any other time. The dependence to be placed on such statements must depend entirely upon the physician's estimate of his patient's powers of observation.

Bladder Disturbances. Bladder disturbances are often present early in pregnancy. As the bladder is dragged upon by the physiological prolapse of the uterus during the first month (which is rather increased in the second month), and is pressed upon during the third month by the increase in the normal anteversion of the uterus, it is easy to see why such disturbances should result. There is apt to be increased frequency of micturition, due to diminution of the capacity of the bladder. As the uterus ascends from the pelvis into the abdominal cavity during the fourth month these symptoms tend to diminish. Incontinence of the urine is more rare, but sometimes occurs from coughing or sneezing when the bladder is partly distended.

Gait. If the patient is made to take a few steps under the eye of the physician, close observation of her gait may prove of value, as pregnant women are apt to walk with a backward pose of the body and a certain carefulness of step from a very early period of gestation.

Figure. When the physician has been previously acquainted with his patient he may sometimes be able to observe at an early period a characteristic change of figure, which is of considerable diagnostic value during the later months. This consists in an enlargement of the breasts and an increased antero-posterior prominence of the abdomen, without a corresponding increase in the lateral diameter.

In estimating the dependence to be placed on observation of the above list of symptoms, it must be constantly be borne in mind that they are all so well known to the laity that many patients are able to construct a history very ingeniously calculated to deceive the physician; that the evidence they give is only cumulative, becoming more definite as a large number of them are present; and that a diagnosis of early pregnancy should never be made from them alone.

PLATE II.

Brunette, æt. 19.
First Pregnancy.

Dark Brunette, æt. 18.
First Pregnancy.

Dark Blonde, æt. 25.
First Pregnancy.

Young Blonde.
Second Pregnancy.

Light Blonde.
Second Pregnancy.

Appearance of the Areola in Pregnancy. (Spiegelberg.)

EXAMINATION OF THE BREASTS AND ABDOMEN.

Breasts. Changes in the breasts are among the earliest signs of pregnancy. Since, however, these changes always persist to a greater or less extent after pregnancy, their value as a sign of pregnancy is much greater in primiparæ than in multiparæ. The breasts of a virgin contain little if any glandular tissue which is perceptible to the touch. The nipples are small, and the skin of the nipples and areolæ is of a delicate pink color. The papillæ in the areola are not noticeable. With the adoption of an active sexual life the nipples become more prominent, the areolæ begin to show a brownish pigmentation, and the areolar papillæ may become evident. As pregnancy supervenes these changes become more marked. In some women the breasts become painful and enlarge within two or three weeks after the occurrence of conception. As a rule, however, the changes become noticeable at a later date. About the end of the eighth week, in most cases, the nipples swell, become erectile, deepen in color, and become more sensitive. The areolæ become darker in color, especially in brunettes, and the papillæ become prominent. Colostrum may be expressed from the breasts as early as the twelfth week in some cases. About the twentieth week a secondary areola is formed outside of the primary areola, this also being most marked in brunettes. As pregnancy advances these changes become more marked, and the surface of the gland becomes traced with bluish vessels. With an enlargement of the abdomen absence of the mammary signs is more important than their presence. (Plate II.)

Abdomen. INSPECTION. At an early period of gestation, beginning with about the twelfth week, the linea alba becomes pigmented, the color darkening as pregnancy advances, and being most marked in brunettes; as this occurs also in other conditions it has but little diagnostic value. An increase in the antero-posterior diameter of the abdomen should be perceptible in spare subjects at about the end of the fourth month, the comparatively slight increase from side to side being an important point in the diagnosis, since most other abdominal enlargements result in a symmetrical increase. This is especially true of distention from tympanites, which is so frequent with women, and should be borne in mind by the physician when consulted on this subject by women whose desires or fears lead them to believe that they are possibly with child.

PALPATION. Deep palpation in the pubic regions will often enable the observer to recognize in the median line the fundus of the uterus and to distinguish it by its shape, consistency, and position, from other pelvic tumors, since the uterus is sufficiently enlarged by the eighteenth week for the fundus to be readily palpated above the symphysis pubis. (Fig. 28.)

In advanced pregnancy abdominal palpation is usually sufficient for a definite diagnosis, as in most cases the outlines of the fœtus can be readily mapped out, the fœtal movements felt, and the fœtal heart sounds heard. For the proper performance of this examination, the patient's clothing should be so arranged that the whole abdomen is exposed, or at most covered by a single thickness of cloth. The patient should lie on her back, with the knees slightly drawn up to secure complete relaxation of the abdominal muscles. The physician should stand by her side, facing toward her feet, and, avoiding all sudden or rough manipulations, should press the ulnar borders of the hands deeply on each side of the uterus until the body of the organ is felt distinctly between the hands. The pregnant uterus yields to

FIG. 28.

(From PARVIN.)

the examining hands a sense of elasticity comparable to obscure fluctuation, which is equally distinct from the extreme hardness of a uterine fibromyoma on the one hand, and from the uniform resistance of an ovarian cyst on the other. If the period of gestation has advanced beyond the seventh month, the fœtal members can usually be made out by palpation, though less definitely than at term. Should the body in question alter its shape and consistency under examination from an oblong, soft, or elastic mass to a more or less firmly resistant organ, it may be assumed that the change is due to a contraction of the pregnant uterus.

These contractions occur intermittently after the eighth week of pregnancy, and although, *per se*, they are not sufficient to warrant

a diagnosis of pregnancy, in connection with other signs they furnish evidence of the highest importance, and it may fairly be said that if they cannot be obtained by friction over the fundus, etc., the uterus does not contain products of conception. The only conditions liable to simulate these contractions are myomata of the uterus, pelvic hæmatomata, and a distended bladder, and these should be differentiated by the history, by the shape of the uterus, and by catheterization.

Fœtal Movements. After the seventh month of pregnancy the examining hand often detects the movements of the fœtal limbs. This sign furnishes valuable but not absolute evidence, as it may be simulated very closely by irregular and spasmodic contractions of the abdominal muscles, especially in hysterical women who suspect themselves to be with child, and long for confirmation of their hopes. It may also be simulated by an irregular uterine contraction, a phenomenon which is more likely to occur when the uterine contents are pathological—*e. g.*, in hydatidiform mole.

Apparent absence of fœtal movements does not exclude pregnancy, as the child may be dead or its movements not felt.

Auscultation. Auscultation furnishes us with two points for observation: the so-called placental or uterine souffle and the fœtal heart sounds. The uterine souffle is an intermittent blowing sound exactly synchronous with the mother's pulse. It may be present or not, and differs greatly in its pitch, tone, and duration in the same patient at different times. It was formerly thought to be due to the circulation of blood through the placental vessels, and, therefore, to be pathognomonic of pregnancy. It is now known to occur in many other enlargements of the uterus besides pregnancy, and is probably due to the increased circulation in the uterine vessels. It often persists for the first two or three days after delivery. Its continued absence is suspicious in alleged pregnancy after the fourth or fifth month, but its presence is merely suggestive. The detection of the fœtal heart sound, with a rate entirely distinct from that of the maternal pulse, is, if observed by an experienced observer, one of the two absolutely distinctive signs of pregnancy, since no other condition can simulate it.

Although it has been claimed that the fœtal heart sounds may be heard as early as the sixteenth week, and certain observers report having heard them as early as the twelfth week, they are not discernible, as a rule, before the twentieth week, and then only under favorable circumstances, as in a patient with thin abdominal walls and close apposition of the uterus to them. After the twenty-eighth week the fœtal heart should almost always be heard, at any rate after repeated examinations. Inability to hear it does not necessarily mean the death of the fœtus, as in cases of hydramnion or of thick abdominal walls the sounds many not be transmitted to the ear. It has been

classically described as resembling the ticking of a watch under the pillow, and when once heard is usually easy to recognize, but it is practically impossible to describe it accurately for the benefit of any one unfamiliar with it. In listening for the fœtal heart the rate of the maternal pulse should be ascertained, because the transmission of the maternal arterial beat through the abdominal wall is the only sound with which it is liable to be confused. It may be heard with great clearness over the greater part of the abdomen, or only in a small area. It is usually heard over the child's back. Therefore, since left positions of the occiput are the most common, its most common site is along the line from the umbilicus to the left anterior superior iliac spine. If it is not heard in that region the whole abdomen should be carefully auscultated. Its absence cannot be demonstrated at any single examination, since changes in the position of the child may make it inaudible at one time and very distinct at another. Its presence can only be decided when it can be counted, and thus differentiated from the maternal pulse. Auscultation of the fœtal heart may be carried out with the ear of the observer applied directly to the abdominal wall, but the most satisfactory method is by means of the binaural stethoscope or phonendoscope. The patient should be placed on her back with the abdominal walls well relaxed. The mouth of the stethoscope should be moistened to prevent its slipping on the abdominal walls, and the instrument should be steadied without the aid of the hands, as the application of the fingers to the stethoscope is often sufficient to divert such feeble sounds as those of the fœtal heart. In many cases when the heart cannot be heard the expedient of holding the child in close contact with the uterine walls by external pressure may succeed. Auscultation of the heart in early pregnancy per vaginam has been suggested, but as it offers no particular advantages and is repugnant to the patient it should not be resorted to. One point of practical importance may be mentioned here. When a fœtal heart is heard plainly, when the uterus is relatively small—*i. e.*, too small to contain a fœtus of five or more months, an abdominal pregnancy with an empty uterus should always be suspected.

The average rate of the fœtal heart sounds is between 130 and 140, with marked variations either way. The slower the heart the greater the likelihood of a large child, and *vice versa*.

VAGINAL AND BIMANUAL EXAMINATION.

Inspection. By inspection of the vaginal orifice we are enabled to note two things, namely: the shape and condition of the hymen, if present, and the coloration of the vagina, more particularly of the urethral bulb.

HYMEN. In women who have had intercourse the hymen is usually lacerated, but an intact hymen does not exclude pregnancy, as a crescentic or even an annular hymen may be so distensible as to admit a full-sized male organ without visible laceration; and, further, numerous cases of impregnation without penetration have been reported. The existence of an intact hymen would make pregnancy improbable, and if in such cases further examination seems desirable, it should be limited to the binanual rectal method until the existence of pregnancy has been absolutely demonstrated.

DISCOLORATION OF VAGINA. A bluish discoloration of the vestibule and anterior vaginal wall has been described as appearing in the majority of cases by the middle or end of the third month. It may be appreciable by the sixth week, or it may not appear until late in pregnancy. It is due partly to venous congestion and partly to actual enlargement of the venous radicles in this vicinity. As pregnancy advances the bluish tinge deepens, at times becoming almost black. When well developed its presence is highly but not absolutely diagnostic, as it may appear in other conditions—*e. g.*, prolapse of uterus, or impacted fibroid—but its absence is of slight negative importance.

Digital Examination. The vagina of pregnancy is somewhat relaxed, moist, and softened from an early period, but these changes are seldom so marked as to furnish important evidence. The alterations in the cervix and uterine body, however, are of great importance. The index finger, or if the size of the introitus permits, the first two fingers, should be thoroughly lubricated and gently passed into the vagina its full length.

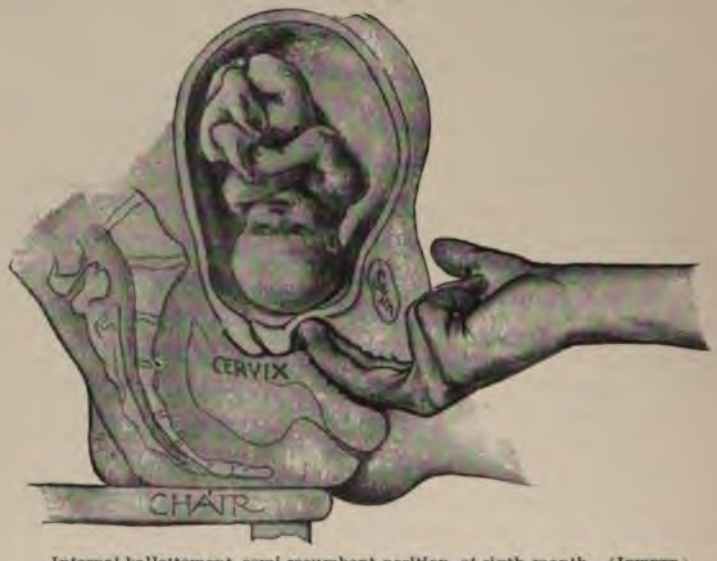
The following points should be carefully noted: the size and direction of the orifice; the firmness of the external parts; the condition of the rectum, whether full or empty; the length and width of the vagina, and the amount of vaginal secretion. The palm of the hand should be turned upward at first, with the external fingers extended across the mons veneris, to enable the examiner to explore the anterior part of the pelvis. The palm should next be turned downward, and the external fingers allowed to lie between the nates, when by gentle pressure upward and backward the perineum may be sufficiently retracted to enable the physician to note the width and shape of the sacrum, and perhaps in contracted pelves to reach the promontory. The finger-tips should then pass slowly forward until they reach the cervix, which is often found high up and well toward the rear of the pelvis. The shape and patency of the external os should be noted, and in multiparæ particularly the os is apt to be patulous and the lips puffy. The length and consistency of the vaginal portion of the cervix should be noticed, as during advanced pregnancy the cervix becomes shortened and softened. The condition of the cervix always depends to some extent on the existence or not of preceding preg-

nancies. The cervix of a primipara retains its more or less conical shape, but becomes somewhat enlarged and softened, and the os is usually small and rounded, rarely becoming markedly patulous. The cavity of the cervix is usually filled by a plug of mucus formed by the increased cervical discharge.

Among multiparæ the external os is usually freely patulous during pregnancy, the finger penetrating nearly to the internal os, and in some cases finding that sufficiently open to permit the finger to come in contact with the membranes or to reach the presenting part; this condition is, however, rare except in advanced pregnancy.

BALLOTTEMENT. By the vaginal touch we are also able to obtain ballottement, which is the most valuable sign of all. (Fig. 29.)

FIG. 29.



Internal ballottement, semi-recumbent position, at sixth month. (JEWETT.)

Ballottement is best obtained with the patient in the standing position, and can never be called absent without an examination in that position. The patient stands in front of the physician with the legs slightly separated. The physician introduces one finger into the vagina, pushing the perineum as far backward as possible, in order to reach as high as may be necessary. The examining finger is then placed in the anterior or posterior fornix and a sharp upward impulse is given, with the result that if pregnancy exists the fœtus is urged upward by the impulse of the finger, and being slightly heavier than the amniotic fluid settles against the finger a few seconds later with a distinct tap, which nothing else within the uterus can simulate.

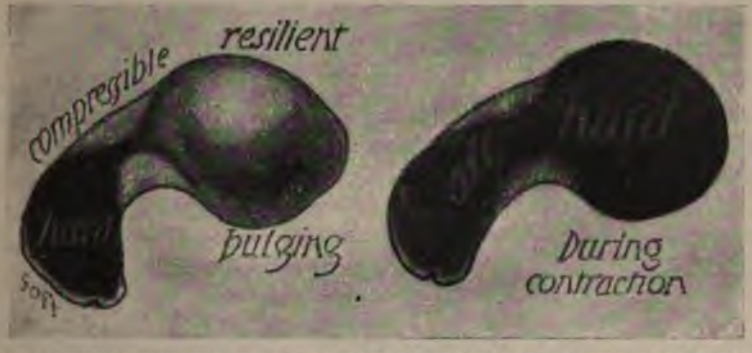
False ballottement may be given by a stone in the bladder, an ovarian cystoma, a small pedunculated subperitoneal fibroid, or by a floating kidney, but careful examination will detect the extra-uterine situation of these pathological conditions.

Ballottement is hardly available before the fourth month, as prior to that time the fœtus is too small and the amount of liquor amnii is too slight. From that time to the eighth month it is obtainable in most cases, but its absence does not absolutely preclude pregnancy.

It is of most value between the fourth and sixth month, before the fœtal heart, which furnishes absolute evidence of pregnancy, can be heard.

Bimanual Examination. By this method of examination we are able to appreciate any alteration in the size and shape of the uterus. An increase in the body of the uterus in all diameters, more

FIG. 30.



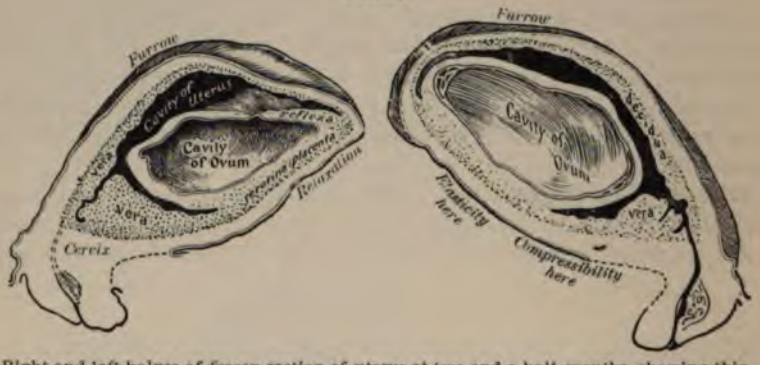
Changes in the pregnant uterus of the sixth week: on the left when partly relaxed, on the right when contracted. Diagrammatic side view. (JEWETT.)

marked in the antero-posterior and transverse than in the long axis, unaccompanied by a corresponding enlargement of the cervix, may sometimes be perceived as early as the eighth, and sometimes even the sixth week of pregnancy. This is not conclusive, *per se*, but taken in connection with the other signs is strong evidence of pregnancy. If opportunity is given to watch the increase in size of the uterus by repeated examinations from week to week a fairly positive diagnosis may be made at an early period. (Figs. 30 and 31.)

HEGAR'S SIGN. The alteration in the uterus known as Hegar's sign is usually easy to perceive, and when present is of great value in early diagnosis. The body of the uterus becomes enlarged in such a way that it overhangs the cervix, especially in front. In addition to the increase in the size of the uterine body a marked softening of the lower segment takes place. As a result of this it appears on bimanual examination as if the fundus and cervix were

unconnected, though on close observation the outer edges of the lower segment seem a little firmer than the intermediate portions, and the cervix and body appear to be joined together by two indistinct longi-

FIG. 31.



Right and left halves of frozen section of uterus at two and a half months, showing thin, relaxed walls and thick decidua. (PINARD.)

tudinal bands. The body has at this time a distinctly elastic feel, and the cervix, though softer than in the non-pregnant state, is much firmer and harder than the rest of the organ. (Fig. 32.)

FIG. 32.

Bimanual examination for compressibility of the isthmus at the sixth week. (JEWETT.)

CHANGES IN THE POSITION OF THE UTERUS. It must also be remembered that pregnancy produces certain changes in the position of the uterus. During the first and second month it sinks lower in the pelvis than normal. In the third month the normal anteversion

becomes more marked except in cases of previous retroversion, as the increased weight of the fundus with its growing contents tilts the fundus downward and forward. In retroversion the displacement is increased for the same reason.

ETHER. In cases where early diagnosis is important, and where examination is made unsatisfactory by thickness of the abdominal walls, or by involuntary resistance on the part of the patient, full anæsthesia should be resorted to.

X-RAY. In doubtful cases the use of the skiagraph will rarely give a positive result as early as the eighth or ninth week, but in most cases the thickness of the pelvic walls obscures the result.

DIAGNOSIS OF PREGNANCY IN MONTHS.

Diagnosis of the period of gestation can never be more than fairly approximate. For convenience, the nine calendar months of utero-gestation may be divided into three periods ; and the signs found on examination, as well as what evidence is obtained from the history, grouped under the proper months.

First Period. This period comprises the first three calendar months —*i. e.*, while the uterus still remains in the true pelvis. *The symptoms are:* (1) Amenorrhœa; (2) nausea and vomiting; (3) changes in the breasts; (4) irritable bladder. *On examination we find:* (1) A slightly patulous os; (2) a softened cervix; (3) uterus slightly lower than normal during first two months, and more anteverted during the third month; (4) bluish discoloration of vagina and cervix; (5) Hegar's sign.

Second Period. During the second period (four to six months)— *i. e.*, the period between the ascent of the uterus into the abdomen and the viability of the child. *The signs and symptoms are:* (1) Amenorrhœa; (2) disappearance of nausea and vomiting; (3) increase of changes in the breasts; (4) diminution of vesical irritation; (5) the uterus rises out of the pelvis. At the end of the fourth month the fundus is two fingers' breadth above the symphysis. At the end of the fifth month it is half-way up to the umbilicus. At the end of the sixth month it is at the umbilicus. (6) the cervix is higher in the vagina; (7) the cervix is more softened and patulous; (8) quickening occurs from the fourth to the fifth month; (9) ballottement can usually be obtained during the fifth month; (10) intermittent contractions occur, increasing in force from the eighth week on; (11) the uterine souffle becomes evident during the fourth or fifth month; (12) the fœtal heart is usually first heard between six and seven months.

Third Period. Seventh, eighth, and ninth months. Period of viability. *The signs and symptoms are:* (1) Amenorrhœa; (2)

slight gastric disturbances; (3) increased breast changes. Colostrum may be present; (4) enlargement of the uterus. The fundus is halfway from the umbilicus to the ensiform cartilage at the end of the seventh month. It reaches the ensiform in the first two weeks of the ninth month, after which it sinks lower; (5) ballottement persists up to the eighth month, when it becomes doubtful. It is absent in the ninth month; (6) protrusion of umbilicus; (7) shortening, thickening, and softening of cervix occurs. It becomes more patulous and harder to reach; (8) the fœtal movements are seen or felt after the sixth month; (9) in the last two weeks the presenting part of the fœtus partially enters the pelvic inlet and the uterus descends with decided relief of the pressure symptoms.

DIAGNOSIS OF PREVIOUS PREGNANCY.

The physician is sometimes called on, usually in medico-legal cases, to answer the question as to whether or not a given woman has ever borne a child. The question is a difficult one to answer, and should be decided only after thorough examination of the genital canal by the bimanual touch and an examination of the breasts and abdomen.

The changes in the nipples and areolæ previously described as due to pregnancy should be looked for. The presence of fine, radiating, cutaneous scars, showing previous distention of the breasts, is good evidence. Scars due to the incision of mammary abscesses possess the same importance, if no other reason for their presence is alleged. Similar cicatrices in the skin of the abdomen should be sought for, and will be found almost invariably if the pregnancy had advanced to the end of the seventh month.

Examination per Vaginam. In a woman who has borne a child the hymen will be absent as such, and in its place will be found the carunculæ myrtiformes; there will be more or less distention and relaxation of the whole vaginal canal; the uterus will be increased in size and altered in shape. The scar of a previous laceration of the perineum may be found; lastly, a more or less considerable laceration of the cervix is almost sure to be found, as few women who advance as far as the middle of pregnancy escape without a perceptible lesion of the edge of the external os.

It is necessary to avoid confounding this last condition with the eversion of the margin of the os, which is sometimes seen in virgins as the result of a chronic endocervical catarrh; and it is always well before expressing an opinion of medico-legal importance to exclude the possibility that a slight laceration may have been caused either by the treatment of a cervical stenosis or pinhole os, or by the extrusion of a polyp from a non-pregnant uterus.

DIFFERENTIAL DIAGNOSIS OF PREGNANCY.

The diagnosis between pregnancy and other conditions causing enlargement of the abdomen can only be made by means of a physical examination. The establishment of the diagnosis may be a task of considerable difficulty, and primarily depends on the decision that the abdominal enlargement is due to uterine enlargement, and then that this is due to pregnancy. Early pregnancy—*i. e.*, in the first three months before the uterus has risen above the pelvic brim, offers the greatest difficulties to diagnosis, and at this time we have no one sign on which we can place absolute reliance, though Hegar's sign is often of great service, since in well-marked cases no other condition can simulate the characteristic signs which are grouped under this name.

Subinvolution resembles pregnancy in many ways, but in this the enlargement is nearly uniform in all directions. In chronic metritis the uterus has not the characteristic elastic feel. An interstitial fibroid in the uterine wall is hard, dense, and uneven. A small ovarian tumor is to be ruled out by the establishment of the extra-uterine position of the tumor, combined with the demonstration of the unenlarged uterus at its side. The diagnosis during this period depends on a careful study of the color, shape, size, and consistency of the cervix and body of the uterus, and the absence or presence of Hegar's sign.

After the fourth month, when abdominal enlargement begins to appear, the diagnosis must lie between pregnancy and all other conditions causing abdominal enlargement. The principal conditions to be considered in this connection are: ascites, ovarian tumor, uterine fibroid, distended bladder, tympanites, obesity, and the condition known as false pregnancy. In differentiating these conditions the three positive signs of pregnancy should always be borne in mind, viz.: (1) Fœtal movements; (2) ballottement; (3) fœtal heart sounds.

In ascites fluctuation is very distinct; the area of the dulness on percussion changes with the position of the patient and the signs of pregnancy are absent.

In ovarian tumors fluctuation is more or less distinct. The abdominal enlargement has come on more slowly and has a peculiar shape. Menstruation is ordinarily present. The outline of the ovarian tumor is less distinct than that of the pregnant uterus. The positive signs of pregnancy are absent. The uterus can be made out as a separate body in the majority of cases; at any rate if an anæsthetic is employed.

A uterine fibroid is harder and firmer than any of the foregoing conditions. It is usually nodular in feel, and is very often asymmetrical. It is usually slow in growth. Menstruation is present,

and in most cases increased and prolonged. The positive signs of pregnancy are absent.

A distended bladder is of comparatively short duration and is attended with much discomfort, and usually there is constant dribbling of urine. Passage of a catheter removes all doubt.

In tympanites the abdomen is resonant on percussion; is variable in size from day to day, and the enlargement disappears under proper treatment.

False pregnancy (a condition in which a stout patient imagines herself pregnant without reason) is most apt to occur near the menopause. Examination under anæsthesia removes all question.

Obesity shows increase in the thickness of the abdominal walls, which are readily palpated, and absence of the intra-pelvic signs of pregnancy.

PREGNANCY COMPLICATED BY ABDOMINAL TUMORS.

When pregnancy is complicated by a previously unsuspected abdominal tumor, the recognition of the latter is only possible when it is rendered accessible by being crowded into prominence below the increasing uterine tumor, or when it can be felt as an accessory enlargement in one or the other flank. When such a tumor is known to exist, any sudden and rapid increase in the size of the abdomen should always suggest the possibility of its complication by pregnancy, and should lead to a careful examination of the uterine body, both abdominally and bimanually. When pregnancy occurs in a uterus already containing fibroids, these tumors usually grow very rapidly, but the diagnosis of pregnancy cannot be made positively until ballottement can be obtained or the fœtal heart sounds heard.

CHAPTER V.

DURATION OF PREGNANCY.

THE first essential for the determination of the duration of pregnancy is our ability to fix the date of conception. This, however, we are not able to do definitely, since in the majority of cases conception cannot be traced to a single coitus. In those cases in which it is safe to assume that conception followed a single coitus of a known date, we find that the average duration of pregnancy is approximately 280 days. The situation is still further complicated by the fact that coitus and impregnation are not necessarily coincident, as it has been shown that spermatozoa retain their vitality outside the body for ten or more days, and our knowledge is too slight to enable us to say how long they may retain their vitality in the oviducts before ovulation takes place and conception results. The first intimation we commonly have of the beginning of pregnancy is that a given catamenial period has failed to appear, and in calculating the duration of pregnancy we must remember that conception may have taken place at any time during the intermenstrual period.

Statistics show that 80 per cent. of all women are delivered within one week of 280 days from the close of the last menstruation, the exact day being probably decided by numerous slight, accidental, mental or physical causes. Most women, however, are more accurate in their knowledge of when menstruation began than of when it ended, and for this reason we usually take the date of the beginning of the last menstruation as our fixed point in calculating the day of labor. To this fixed point we add five days, which represents the average duration of menstruation, and then add 280 days, which gives us the approximate date of labor. A more convenient and an approximately correct method is to count back three months, or forward nine months, from the date of the beginning of the last menstruation and add five days.

It was formerly thought that conception could be avoided in almost all cases by abstinence from coitus during the first few days after and before menstruation, but as ovulation is probably entirely independent of menstruation, impregnation can occur in any part of the menstrual month. The possibility that conception may not have occurred until just before the period which was expected, but failed to appear, explains readily the frequent occurrence of cases in which delivery takes place three weeks after the expected date. It is a

matter of practical observation that if a woman passes her time by one week the probable date of delivery should be set about a fortnight later.

An approximate check upon this reckoning may be effected by observing the date of quickening, which in most cases occurs at about four and a half months, but women vary so much in their powers of perception that it is at best of little absolute value. Some confirmatory evidence may also be obtained by observing the size of the uterus, but this again does not give absolutely accurate information, varying in different individuals within certain limits.

In patients who conceive during lactation, when menstruation is suspended, dependence must be placed on the date of quickening and the size of the uterus, which can only give approximate information. Some observers lay stress on the estimation of the size and weight of the fœtus in this regard; but the results obtained do not encourage us to place much dependence on this method of calculation, and there are elements of error involved here, aside from those which must arise from the uncertainty of obtaining accurate data by the indirect methods of measurement which must be employed.

At most then we can only approximately predict the date of delivery, and unavoidable errors are often a source of great annoyance to both physician and patient; but from the above facts it can readily be seen that an error of three weeks is possible in any case. Some help may be obtained from the fact that lightening occurs about two weeks before labor is to be expected, and in primiparæ this sign is of considerable value. Another factor which apparently exerts some influence on the length of pregnancy demands some mention.

Many careful observers claim that pregnancy, instead of corresponding to ten lunar months in length, corresponds to ten menstrual months, the argument being that the majority of women menstruate regularly every twenty-eight days, and, therefore, the average duration of pregnancy is 280 days; whereas, the normal length of pregnancy for those who menstruate every twenty-six or twenty-seven days would be 260 or 270 days.

There seems to be some ground for this assumption, but against it seem to be those cases in which menstruation occurs at shorter intervals—*e. g.*, every twenty-one days, for pregnancy with these women does not end at the 210th day.

PROLONGED PREGNANCY.

The possibility of an abnormally prolonged pregnancy is a question which comes up frequently in medical practice, and is sometimes of medico-legal importance. The prolongation of pregnancy beyond three hundred days is strongly discredited by the weight of authority,

and probably even this is a high limit. It must be borne in mind, however, that conception may have occurred twenty or more days after the date set as the beginning of pregnancy, and that owing to some irregularity of menstruation, an unusually long intermenstrual period may have preceded conception. Even the few well-observed cases are probably due to these causes, and an attitude of skepticism in regard to them will give rise to few mistakes. In the cases which most nearly deserve belief an amenorrhœa lasting an unusual period has been followed by the birth of an unusually large and well developed child. Cases have been reported up to 326 days, and the French and German legal codes recognize the legitimacy of a child born 300 days after the death or absence of the reputed father.

CHAPTER VI.

HYGIENE AND MANAGEMENT OF NORMAL PREGNANCY. FUNCTIONAL DISORDERS OF PREGNANCY.

ALTHOUGH gestation is a physiological process, and, in a normal woman under normal conditions, ought to progress without subjecting her to a greater strain than her system can endure, the great alterations in the sexual organs, with the concomitant strain on all the other organs, produce a symptomatology which differs from disease in degree rather than in kind, so that a normal pregnancy may be defined as one in which the disorders of the various organic systems do not exceed normal limits. In the management of normal pregnancy the physician should aim to limit his attention to the regulation of the habits and general hygiene of the patient, and should encourage her to endure the discomforts incident to her condition as long as they remain within the limits of health, avoiding all unnecessarily active treatment. This line of action implies an accurate knowledge of the various disturbing conditions which may arise, and it is impossible in treating of the management of pregnancy to draw the line sharply between the normal and the abnormal; for this reason it is most convenient to consider, first, the general hygienic precautions to be adopted in all cases, and later the disorders of the various organic systems, separating the normal from the pathological under each heading as far as may be done.

Diet. If a pregnant woman is to remain well nourished, the energy necessarily expended in the nutrition of the fœtus must be provided for by increased absorption of food. In some women the increased demand is met by better assimilation of the food taken, without a marked increase in the amount, but in most cases the requirement is met by an increased ingestion of food; in simpler words, the patient's appetite is improved. This increase in the desire for food is most marked during the later months of pregnancy, when the fœtal growth is most rapid. At this period of gestation, however, on account of the marked encroachment of the growing uterus on the abdominal space, the ingestion of unusually full meals causes discomfort to the patient, and it is a general rule that pregnant women should be advised to satisfy their appetites by eating moderate quantities at frequent intervals, rather than large amounts at the regular meal-times. A glass of milk or a cup of coffee before rising, with light lunches in the middle of the morning and after-

noon, is of distinct advantage as a routine measure, in addition to the regular meals. Many women sleep better and find that faintness in the morning is much relieved by taking a light supper shortly before retiring.

No restriction of diet is necessary beyond the fact that very rich and highly-spiced foods which predispose to heartburn, etc., should be avoided.

Constipation is very common, and is to be carefully guarded against by regulation of the diet or by the exhibition of cathartics if necessary.

Bathing. Frequent bathing of the whole body is particularly to be enjoined. Full baths should be taken daily in most cases; the temperature of the water should be either warm or cool as preferred, the extremes of temperature to be avoided. The increased metabolism of pregnancy involves an increased activity of the excretory organs, and nothing is more liable to encourage disturbances of the kidneys than the increased work thrown on them by the inactivity of the skin, which is due to the imperfect removal of the wornout epidermis and the consequent clogging of the excretory ducts by their own secretions.

Exercise. Labor being itself a severe muscular exertion by no means inaptly comparable to the feats of endurance in preparation for which athletes undergo a prolonged course of training, it is important that every patient should be encouraged to take during pregnancy as much light exercise as she can without undue fatigue. Violent exercises, especially those which involve jarring motions of the body, should be forbidden, the shock occasioned by jumping even from low elevations being an especially common cause of miscarriage.

Walking on level ground is the best exercise for a pregnant woman, as she thus gets not only exercise but the fresh air which she needs. If the patient is unable to walk freely, then driving in a carriage will secure the necessary air and sunlight, but the jarring motion of the carriage causes fatigue and backache to some women, and for them is to be avoided. Long railroad journeys are to be avoided if possible, but in the absence of some special contraindication ordinary railroad travel is permissible between three and seven and a half, or even eight months. Sea voyages may be taken unless the patient is unduly subject to nausea. The removal of all avoidable care and responsibility is to be desired, since the strain of social and business cares during pregnancy predisposes the patient in a marked degree to the various nervous and mental complications which frequently arise.

Douches. The increase in the vaginal and cervical discharges which takes place during pregnancy makes frequent bathing of the external genitals necessary to comfort. If the discharges are acrid

in character, the use of vaginal injections sometimes becomes necessary in order to avoid the very troublesome pruritus of the external genitals, which is liable to arise if this condition is untreated. No risk is to be apprehended from the use of lukewarm douches in small quantities—*i. e.*, a pint or less.

Sexual Intercourse. Coitus in moderation is not usually harmful during pregnancy, but excessive indulgence is a frequent cause of miscarriage; its frequency should be regulated by a moderate restraint of the desires of the woman, which, however, may be increased at this time, and not by the appetite of her husband. Connection should be avoided at the times when the catamenial periods would be present if she were not pregnant.

Dress. The clothing during pregnancy should be loose, great care being taken that it should be so adjusted as not to compress the abdomen and chest. Tight lacing should be forbidden. Heavy skirts should be replaced by warm underclothing, and all the clothing of the lower part of the body should be buttoned to a special waist worn beneath the dress, so that its weight is borne by the shoulders and not by the abdomen.

Corsets should be given up, and in those women whose large and pendulous breasts render a support of some sort necessary for their comfort, they should be replaced by a linen waist, which supports the breasts without compressing the abdomen. Circular garters should be forbidden on account of their liability to increase any tendency to varicose veins; and should be replaced by elastic suspenders attached to the waist, already referred to. The shoes should be broad and easy, with low, flat heels.

Pressure upon the developing nipples should be prevented by the looseness of the clothing, and, if necessary, by the adoption of a nipple shield. Massage and pulling upon the nipples should be avoided, not only because injurious to the nipple itself, but because they tend to provoke uterine contractions. Lactation during pregnancy should be given up on account of the danger to the interests of the nursing child, as the milk of a pregnant woman is almost invariably poor, as well on account of the drain on the mother's vitality. The nipples should be bathed frequently for purposes of cleanliness, but the use of astringents is to be avoided, as astringents simply tend to injure the delicate epithelium which covers the nipples. If the nipples are hard and horny they should be softened beforehand by the frequent application of lanoline or some other emollient, to prevent cracking when nursing begins.

Urine. The urine should be carefully examined, both chemically and microscopically, from time to time during the early months, and every month or oftener during the later months of pregnancy. The examination should include a careful estimation of the amount of urea excreted from time to time, as failure in this respect probably

gives a better indication of the impending danger of eclampsia than any other one sign. The examination should be repeated at once should any suspicion of uræmic trouble arise.

General Directions. The patient should be instructed to send for her physician at once upon the appearance of any abdominal pain; of persistent headache or dizziness; or of nausea and vomiting after the nausea of early pregnancy has disappeared; or if she notices even the slightest stain of blood on her clothing. She should be cautioned to avoid lifting or stretching—*e. g.*, hanging pictures, placing a dress on a high nail, etc. She must be warned of the danger incident to even the slightest blows on the abdomen, such as may be caused by the unguarded motions of a child or of her husband when asleep. If the patient is a primipara she should be informed that the early pains of labor are liable to be mistaken for an attack of colic.

Pelvimetry. There is now no question but that the proper management of pregnancy should include the careful measurement of the pelvis in every case, at least by external pelvimetry, and, if the external pelvic measurements show diminution, the internal measurements should also be taken. Although the above should be made the general rule of practice, exceptions to this law may be made in multiparæ who give a history of previous easy labors and in primiparæ with a manifestly ample pelvic development. In all other cases the physician who would offer to his patient the full advantages of modern obstetrics must measure her pelvis.

The time at which pelvimetry should be performed varies with the belief of the individual obstetrician. The physician who believes that the induction of premature labor is preferable to the performance of an abdominal delivery at term in cases in which the pelvis is too small to permit the passage of a full-sized child should take the pelvic measurements at some time during the latter part of the seventh or the early part of the eighth month, while he who believes that an abdominal delivery is preferable in all cases to the induction of premature labor may properly wait until the time of labor is near before he measures the pelvis.

Even if pelvimetry has been neglected before the advent of labor both the external and internal measurements should be made in all primiparæ in whom at the beginning of labor the fœtal head is found above the brim. This rule admits of no exceptions, since the failure of the head to enter the pelvis under the pressure of the tense abdominal walls of a primipara always raises a question as to the size of the brim, and because the proper treatment of this class of cases depends on the definite knowledge of the size of the pelvis, and the neglect of this simple precaution increases greatly the risk to both mother and child, since attempts at delivery per vaginam are often made in patients whose pelvic diameters are so contracted as to render a favorable result at least improbable.

SPECIAL DISTURBANCES OF THE SEVERAL ORGANIC SYSTEMS DURING PREGNANCY.

Circulatory System.

Anæmia. Examination of the blood of the pregnant woman shows that during the first few weeks of pregnancy a condition of hydræmia, or relative anæmia, develops. The red corpuscles and the hæmoglobin both show a more or less marked diminution. This condition is, however, only temporary, and within a short time the blood is found to be richer both in corpuscles and in hæmoglobin than in the same woman when not pregnant.

This change may, however, not occur, and the condition of anæmia may persist to a greater or less degree in a certain proportion of cases. It is only, however, in aggravated cases, where the patient is evidently losing strength, that anæmia assumes any pathological importance. As a consequence of anæmia many pregnant women are subject to attacks of syncope; but these need occasion no anxiety, unless they are of long duration or extremely frequent. The same holds true in regard to the palpitation and dyspnœa which are so frequent in anæmia. Œdema of the lower extremities is of frequent occurrence during pregnancy, and is sometimes dependent on the anæmic state. It is usually transient and of no importance as long as it is confined to the feet and ankles; but if even very slight œdema occurs in the hands or face it should excite the suspicion of the physician at once, and the urine should be examined. This anæmic œdema of the feet and ankles is rarely marked enough to demand any special treatment. If it becomes extreme without uræmic cause, more relief will be obtained from general and hygienic treatment than by depletion in any form, since this would only serve to increase the hydræmia on which the œdema is dependent.

The anæmia of pregnancy may, in rare cases, and most often in multiparæ, take on a distinctly pernicious form, with progressive loss of strength, emaciation, and all the other classical symptoms of pernicious anæmia, but between this form and the ordinary type of anæmia no sharp line of separation can be drawn.

Treatment of Anæmia. The first and most important rule is that for the treatment to be effective in this condition it must be undertaken during the early stages of the affection. Since the cause—pregnancy—can only be removed in cases where the mother's life is endangered, the most that can be hoped from treatment is the arrest of the progress of the disease. There is little hope of improvement until after delivery; for this reason treatment must be begun as soon as the symptoms become distinctly prominent. This is especially important in patients showing weakness in any other direction, since most of the other affections of pregnancy are dependent on or aggra-

vated by anæmia. This is especially true of the urinary and nervous complications.

As in the treatment of ordinary anæmia, the preparations of iron are the most important medicinal agents. Their efficacy may be increased by the addition of arsenic. Of more importance than the medicinal treatment, however, in the anæmia of pregnancy is the adoption of proper hygienic and dietetic precautions. First among these comes the regulation of the digestive tract. Constipation, if present, must be overcome. Dyspepsia must be relieved by a suitable diet, and lack of appetite must be made up for by a system of forced feeding if necessary. Avoidance of fatigue, whether mental or physical, and of worry, is very important, but the prime factor in treatment is the assimilation of as much nourishment as possible. The pregnant woman, however, can rarely obtain sufficient food from three meals a day as in health, and the best rule is to prescribe small quantities of the most simple food at short intervals. Simple animal foods, such as milk, eggs, and raw oysters, are to be preferred, but may be combined with smaller quantities of the farinaceous foods, such as puddings, and bread not too recently baked. These should be administered in all cases midway between the meals, and in extreme cases should be given in small quantities as often as every half-hour, or even every fifteen minutes. It is surprising how much nourishment will be taken in this way by patients who are utterly unable to eat a full meal.

The fluid preparations of iron are rarely well borne by the stomachs of patients in this condition. Reduced iron, or some similar preparation in the form of a pill, combined, if necessary, with 1-60 grain of arsenic, t.i.d., is ordinarily the best prescription. The bowels should move at least once a day, as no proper assimilation of food can take place in the presence of constipation.

Fresh air is of great importance. If driving is not permissible for any reason, it is well to dress the patient warmly and place her in the sun before an open window, for from one-half hour to one hour, once or twice a day, and in extreme anæmia the absolute avoidance of muscular exertion is of the highest importance.

The treatment of the pernicious form of anæmia differs from that of the simple form only in that all precautions must be more stringently carried out, and that the increased severity of the condition renders the preferences of the patient less worthy of consideration.

The fact that the pernicious anæmia of gestation is directly dependent on and terminates with pregnancy suggests at once the question of the induction of abortion, miscarriage, or premature labor, as the case may be. This question is to be answered in anæmia, as in most other pathological conditions arising during pregnancy, by consideration of the fact that there are two lives involved, and that of the child must not be sacrificed until it becomes fairly evident that

further delay will involve the loss of both lives; and it is not until the strength of the mother is so far reduced that her ability to sustain the burden of pregnancy to its natural end becomes doubtful that this question should be raised. Even when such doubt exists it should be decided only after consultation with one or preferably two other physicians.

Varicosities. One of the most annoying of the occasional accompaniments of pregnancy is the gradual development of varicose veins to a greater or less extent in one or both legs. Though not constant, it is very common, and once present is usually progressive, increasing in amount with the duration of pregnancy, subsiding only partly after delivery, and recurring in a more marked form with each succeeding pregnancy. Dilatation of the veins of the vulva and vagina is less common, and usually occurs only in the presence of a somewhat excessive varicose condition of the extremities. The dilated veins in either locality may reach a point at which rupture actually occurs or threatens, but this fortunately is rare.

In cases in which rupture does threaten, the patient should be furnished with a small pad of folded linen, to which a strap and buckle have been sewed, and shown how to apply it over a bleeding point, that she may be prepared for the emergency, in case it should arise.

Treatment of the varicose condition should be undertaken early, not only for the sake of preventing any increase of trouble, but also because the existence of even slight varicosities exposes the patient in many cases to considerable dragging pain and sense of fatigue in the affected limb, but during pregnancy no improvement is to be expected, and, indeed, complete arrest of progress is unlikely. The only effective treatment is that rendered by mechanical support of the dilated veins. This can be secured either by the use of the elastic stocking made to fit the individual patient, or by a properly constructed flannel bandage. The elastic stocking is the more comfortable, but is less effective and decidedly expensive. If used, it should be manufactured to fit the individual limb, after careful measurement by the physician or by an experienced maker. The measurements should be taken in the morning, before the patient has been on her feet at all, and in every case the physician should indicate the points at which pressure is desired. It is especially necessary to avoid compression above the varicosity, as this would tend to increase the trouble. The flannel bandage is less comfortable and more troublesome to apply, but is more effective, as the life of the elastic stocking is comparatively short, and it ceases to be of value as soon as the elasticity fails. It can be made by the patient according to the directions of the physician. The cheaper flannels make the best bandages, as they are more elastic than the expensive ones. For a patient of ordinary size one and a half yards of flannel should be cut on the bias into strips four inches wide. The strips should be basted together without

turning the edges. The bandage should be applied tightly before the patient gets out of bed in the morning, from the toes to a point as near the groin as possible, and should be worn throughout the day, being removed on retiring. Care should be taken in applying the bandage to avoid local constrictions, and the pressure should be rather less in the upper part of the leg than below. The object to be attained by the use of either the elastic stocking or the bandage is that the veins shall never be unsupported when the patient is in the erect position. The ordinary rubber bandage should never be used. Its macerating effect on the skin and the itching it causes render it unfit for use in this condition.

Thrombosis. Thrombosis of the veins of an extremity or in the pelvis may occur as a consequence of the venous stasis of pregnancy, but is more common after delivery, when it is, however, usually due to septic infection. The treatment of thrombosis during pregnancy is the same as that of thrombosis at any time, and consists mainly in securing absolute rest of the affected limb, on account of the danger of embolism. To secure absolute local rest the whole body should be kept as quiet as possible, since the motion of any one part of the body invariably involves some action of the whole muscular system.

The patient must be put to bed as soon as any suspicion of thrombosis arises, and the most absolute quiet insisted on. This treatment must be continued for at least two weeks after all swelling of the affected limb has disappeared, in order to afford sufficient time to warrant the assumption that the clot has become organized and all danger of embolism is past. When the detachment of an embolus takes place the treatment is conducted on the same principles as in any other case of embolism, the only obstetrical indications being that if miscarriage occurs spontaneously, labor should be expedited as much as possible, and that in case of sudden death of the mother an attempt should be made to save the life of the child, provided gestation has reached the period of viability.

Vulvo-vaginal thrombosis, the only form which merits a special description, is much more common after delivery, and will be fully described in the section which treats of the puerperium.

Hemorrhoids. Hemorrhoids occur very commonly during pregnancy, but they seldom cause much discomfort until a few weeks before or at the time of delivery. An attack of painful hemorrhoids during pregnancy must be treated upon the same lines as at any other time, with the single exception that the treatment must always be confined to mild and palliative measures, since any operative treatment will expose the patient to the dangers of an unnecessary abortion.

Hemorrhage. Flowing is rare during pregnancy except when due to obstetrically pathological causes, such as placenta prævia, hydatidiform mole, attempted abortion, etc. Should it occur in the absence

of these conditions, the existence of endocervical malignant disease, of a uterine polyp, of extreme congestion from prolapse, or of some other pathological condition should be suspected, as it is probable that most reported cases of menstruation during pregnancy have some pathological origin.

Digestive System.

Dyspepsia. Dyspepsia is a not infrequent accompaniment of pregnancy, but when uncomplicated by nausea rarely assumes importance or needs any treatment except for the relief of discomfort. It must not, however, be confounded with the appearance of severe epigastric pain, a symptom which should always suggest the possibility of an impending eclampsia. During the later months the patient may be troubled with heartburn, eructations of gas, etc., which are usually due to hyperacidity of the gastric juice, and can be readily relieved by the use of some mild alkali. Prophylactic treatment during the earlier months is of considerable importance. It is popularly believed that pregnant women often experience longings for improper kinds of food. In such a case, if the patient were not restrained from satisfying her abnormal appetite, she would pave the way for the development of troublesome gastric disturbances during the later months. The most successful remedy in the treatment of the hyperacidity seems to be magnesium carbonate, and a lump of this chalk-like substance should be kept at hand by the patient, who should take it as necessity arises. The alkaline mineral waters, subnitrate of bismuth, etc., are often of value.

Nausea and Vomiting of Pregnancy. Irritability of the stomach manifested by nausea and vomiting, most often in the morning, has long been considered as one of the inevitable discomforts of early pregnancy. That this is not strictly true is proved by those cases which are not only free from nausea, but in which appetite and general digestive functions are improved during pregnancy. What then is the cause of this distressing symptom? If careful search is made in each individual case a direct exciting cause will be found in the vast majority of cases. In some the nervous system is unstable and excitable. In others malposition of the uterus or some other intrapelvic abnormality acts as the exciting cause. Others suffer from deficient excretion or some other systemic poison. The predisposing cause in all cases is to be found in the increased irritability of the nervous system characteristic of pregnancy, which exaggerates reflex stimuli. The fact that it is usually limited to the early part of gestation is a manifestation of the adaptability of the nervous mechanism to new conditions. This theory is further borne out by the fact that multiparæ are less subject to the trouble than primiparæ, and that working-women, who have less time to think of their ail-

ments, are much less subject to it than those who do not do physical work. The symptoms are in most cases a feeling of nausea as soon as the patient rises in the morning, followed by the vomiting of a small quantity of watery mucus. In other cases there is no vomiting, but the patient simply makes the effort and is relieved by it.

The nausea and vomiting of pregnancy usually begins during the second month of gestation and usually persists into the fourth month. If, as is the rule, the general condition of the patient remains unchanged, showing that she is absorbing sufficient food for her general nutrition, the condition may be left untreated, and the patient encouraged to bear the discomfort in the expectation that it will cease at the usual time.

Although the ordinary nausea and vomiting of pregnancy is productive of nothing more than discomfort to the patient, and may be regarded almost as a physiological accompaniment of pregnancy, they may in a small number of cases become so much exaggerated as even to threaten life. The patient is then nauseated by the sight or smell of food; the vomiting becomes uncontrollable; and, owing to her inability to obtain a proper amount of nourishment, she shows progressive emaciation and loss of strength.

These cases of hyperemesis are of the utmost gravity, and call for a very guarded prognosis, which must be made better or worse in accordance with the absence or presence of marked emaciation, etc.

TREATMENT. The treatment of the hyperemesis of pregnancy separates itself naturally into three divisions according to the gravity of the situation in the individual patient: 1. The first comprises the hygienic management and the various methods of forced feeding. This should be employed in all cases, and may be sufficient in itself. 2. The second confines itself to the treatment of intercurrent gastric diseases and local disorders and malpositions of the cervix and uterus. 3. The third is the last resort, the induction of abortion.

1. *Diet and General Care.* The woman should be put to bed and kept in the prone position, since this position alone may ameliorate the condition. Black coffee the first thing in the morning may tend to allay the symptoms. It is inadvisable to attempt to treat such cases by the temporary deprivation of food, which is so valuable in the treatment of vomiting after surgical operation, and in gastritis, etc., as the loss of strength entailed by starvation outweighs any prospect of relief. From the time that nausea first begins to be troublesome it is important that the patient should be given small quantities of food at short intervals at the times when it seems most likely to be retained. In some cases the administration of a small quantity of food immediately after vomiting will enable the patient to absorb enough nutrition to keep up a fair degree of strength. The best foods for this purpose are the simple albumins, which are absorbed after a minimum degree of exertion by the digestive organs.

Milk, plain or mixed with lime water or soda water, koumyss, matzoon, raw eggs, alone or beaten up in milk, expressed beef juice, and raw oysters are good examples of the class of food best absorbed by the patient. Small quantities of food should be given her frequently without regard to her sensations, the size and frequency of the dose being determined by observation of the amount retained. It is always well to consult the patient's desire for any particular kind of food, for this is apt to be an indication of her power of retaining what she eats. When the stomach does not retain enough food to support the patient's strength, rectal alimentation, carefully carried out, will sustain life for a considerable time. The routine of this treatment is simple, and gratifying results are often obtained. The lower bowel should be washed out every morning by a copious, cleansing enema to prepare a clean absorbing surface. An hour after the cleansing enema the nutritive enema, consisting of four to five ounces of easily absorbable food, should be given. Peptonized milk, three ounces, beef juice, one ounce, and the whites of one or two eggs make a good combination. This can be repeated every four hours in the majority of cases. For thirst, enemata of normal saline solution may be given between the nutritive enemata, with little disturbance to the rectum. The addition of alcohol to the enemata tends to increase the irritability of the rectum, and it should be reserved until the indications are marked. The enemata should be slowly injected as high as possible into the rectum through a rectal tube, and the patient's position should remain unchanged for at least half an hour afterward, the anus being supported by a pad, held by the nurse, for from five to ten minutes..

A large variety of medicinal agents have been advised for the treatment of this condition, but few have had any effect except in isolated cases. The remedies most favorably known are the oxalate of cerium in 5-grain doses, preferably combined with 5-grain to 10-grain doses of bismuth subnitrate; bicarbonate of soda, dissolved in soda water, a drachm to the quart siphon, taken freely, is highly recommended by Fordyce Barker. When all other remedies have failed, relief is sometimes afforded by chewing spruce gum. Relief is sometimes obtained by the application of cold to the cervical vertebræ and to the epigastric region. Quite recently the treatment of this condition by the subcutaneous infusion of normal saline solution has been advised, on the theory that we have to deal in these cases with a mild toxæmia, and good results have been reported. It is a simple expedient and can do no harm, and at any rate relieves the patient's thirst and supplies much needed fluid to the tissues.

2. *Treatment of Local and other Organic Conditions.* The authors' experience leads them to believe that the more severe degrees of the hyperemesis of pregnancy are almost, if not quite, invariably dependent upon one of three causes : first, uræmia; second, severe

constipation; third, the existence of some lesion or abnormality in the pelvic organs. If uræmia is present the treatment proper to that condition should be at once instituted. If constipation is found, the bowels should be unloaded by the gentle but persistent use of cathartics. If neither of these conditions is found, it may be fairly presumed that some lesion of the pelvic organs is accountable for the trouble, and the most careful of pelvic examinations, under ether if necessary, should be at once made. When hyperemesis is dependent upon organic lesions—as, for instance, upon small tumors in the uterine muscles, and the reflex irritation is due to their presence in the enlarging uterus—no relief can ordinarily be expected, and abortion should usually be performed. When the lesion is functional every effort for its relief should be at once made. The most common of these functional lesions is a retrodisplacement, which may be simple or complicated by the presence of adhesions. In uncomplicated cases the immediate reposition of the uterus under ether, and its retention in place by a suitable pessary, is ordinarily followed by the prompt cessation of the vomiting. When adhesions are present it may sometimes be possible to relieve the vomiting by raising the fundus with a vaginal packing. The persistent use of such treatment exposes the patient to a considerable danger of the termination of pregnancy, but since the prognosis is otherwise grave this risk must be taken. It would seem, theoretically, that, in the case of failure of minor treatment, the replacement of an adherent retroverted uterus by an abdominal operation might be permissible; but since such operations are usually followed by abortion, it is, in the majority of cases, more for the interest of the patient that abortion should be induced and a correction of the retrodeviation left for subsequent treatment.

Even in the absence of such lesions it has been found the hyperemesis is frequently relieved by dilatation of the cervix, though the reason for this is still unknown.

Strange as it may seem, this operation is rarely followed by abortion, unless the dilators are passed beyond the internal os and rupture the membranes. Relief may sometimes be obtained in this way, even though the external os be patulous and the internal os not especially small. In this operation an anæsthetic is unnecessary, and, indeed, harmful, owing to the increase in vomiting liable to follow the use of either ether or chloroform. Dilatation may be performed by the finger, but is preferably done by the use of the ordinary steel dilators.

The vagina should be thoroughly irrigated with bichloride solution. The cervix should be exposed through a speculum, and its length measured by the passage of a uterine sound until it is arrested by the resistance of the internal os. The dilators should then be inserted and very gradually expanded until the internal os is suffi-

ciently dilated to allow the passage of the index finger through it until it comes in contact with the membranes.

3. *Induced Abortion.* Having failed to relieve the patient by any of the procedures described above, we are met by the question as to the propriety of resorting to artificial abortion. This is always a difficult problem and one which must be settled for each case. If abortion is resorted to early enough it never fails to relieve the vomiting and places the patient in a position for a rapid convalescence, while if it is delayed too long—*i. e.*, until the patient is on the verge of collapse—the added exhaustion of even a three months' labor is apt to be fatal. On the other hand, the rights of the fœtus must not be forgotten, and moreover, it is a fact that the most severe vomiting may cease at any moment without apparent cause, in which case recovery is to be expected, even though the patient is in a condition of extreme exhaustion. The gravity of the situation is increased by the early appearance of exhaustion, and diminished by the maintenance of a fair degree of strength until near the time when a spontaneous disappearance of the vomiting may be expected. In deciding the question some regard must be paid to the religious beliefs of the individual family and upon their estimate of the relative value of the maternal and fœtal lives. It is the physician's duty to set the facts clearly before them and abide by their decision; but the question is so serious that it is always wise to submit the case to the best consultants available before giving an opinion. Among Protestant physicians and in Protestant families it is usually considered the best practice to advocate abortion when all other treatment has failed; when the vomiting is so incessant as to render the retention of a sufficient amount of nourishment impossible, and shows no signs of decreasing; when rectal alimentation has failed; when the patient's condition is growing worse daily; and the pulse is steady at or above 110 and still rising. It is important to remember that patients are constantly lost by over-conservatism even in the most skilled hands; that the final collapse comes on rapidly, and when this occurs the question usually to be decided is not: "When shall abortion be done?" but, "Will not abortion kill the patient?" In any case abortion is an operation that cannot be undertaken without manifest impropriety until after formal consultation with one and preferably two other physicians who have had an opportunity to make a thorough examination of the patient.

Salivation. The increase in the secretion of saliva during pregnancy is commonly slight, seldom troublesome, and only rarely productive of positive discomfort. In the rare cases in which treatment is necessary there is unfortunately little hope of relief. The frequent use of small doses of atropine has been recommended as permissible, but, for the sake of the child and the woman's general health, should be avoided if possible. Some relief is occasionally afforded by the

frequent and persistent use of a solution of tannic acid as a mouth-wash.

Constipation. There is during pregnancy an especial tendency toward habitual constipation and the accumulation of fecal material in large quantities in the intestines. This condition is probably due to a diminution in peristalsis as a reflex result of the mechanical pressure exerted by the enlarged uterus on the intestines. It is of extreme importance to the well-being of the patient, not only during the pregnancy, but also during the puerperium, that this accumulation be reduced to a minimum. To obtain this result it is well to administer a mild cathartic every night or every other night, unless the bowels move very freely naturally, as the bowel is seldom emptied by a single daily movement.

A great deal may be accomplished toward maintaining free catharsis by the addition of a fair proportion of fruit to the patient's diet, and this may be all that is necessary. Among the whole list of cathartics there are only a few which can be used habitually without producing toleration and the necessity of increasing the dose. Prominent among these are aloes and cascara sagrada, and for this reason they are particularly valuable in the constipation of pregnancy.

A good prescription for patients who are able to take pills is: ℞.—Pil. aloin et cascarin co. Sig.—One or two at night. A formula which is not officinal, but is generally recognized.

If the patient is unable to take pills, the fluid extract of cascara in doses of 10 to 30♏, t.i.d., or the following prescription may be given:

℞.—Tr. aloe. Socot.,
Elix. tarax. co. . . . . āā ℥ij.
Sig.—Two teaspoonfuls after meals.

If the existence of masses of hardened feces is suspected, the attempt to empty the rectum by an enema of glycerin and soapsuds should be made, preferably preceded by a high enema of oil given an hour or two before, or it may be necessary to devote some days to emptying the bowels by frequent small doses of more powerful cathartics before beginning on the above prescriptions. The habitual use of enemata during pregnancy is not to be advised on account of their tendeny to aggravate existing hemorrhoids or to produce a catarrhal proctitis.

Urinary System.

Urine. Albuminuria is of such common occurrence in pregnancy that many observers consider it practically a normal condition. Examination of a large number of cases shows albumin in about 20 per cent. of all cases, though this proportion will hardly be attained

unless cases of slight cystitis more or less transient in their character are included in the list. Albuminuria in itself is unimportant except for the fact that observation has shown that eclampsia is much more common in pregnant women whose urine constantly contains albumin than in those whose urine is free from it.

The occurrence of casts and blood in the urine is always pathological and suggests the gravest danger, even though the casts be merely hyalin or granular, and of small size, and the patient shows no other symptoms. The finding of blood and casts in the urine is a sufficient indication for confining the patient to bed and instituting the strictest treatment until the renal irritation quiets down.

An almost equally important sign of threatening danger is a marked diminution in the amount of total solids excreted in the urine. To determine whether this diminution is relative or absolute the twenty-four-hour amount of urine must be known and the amount of urea excreted estimated. Relative diminution of the total solids is of no importance, but any marked diminution in the total twenty-four-hour amount should be regarded as a sign of serious import and receive prompt attention. Throughout pregnancy it is not uncommon to observe a tendency toward concentration of the urine. This tendency should suggest danger, and should be met by unremitting watchfulness and appropriate treatment. In hysterical women, and in some other cases also, the urine is increased in quantity and decreased in specific gravity, a condition which, like all variations from the normal, is to be suspected, and is sufficient ground for careful supervision of the patient. An increase in the frequency of micturition is of normal occurrence from the time that the distention of the uterus begins to exert pressure on the bladder. These normal variations differ only in degree from the pathological alterations which are dependent on the existence of distinct functional disturbances of the secreting tissues. The origin of these functional disturbances, and even of nephritis during pregnancy, is at present a matter of conjecture, but the clinical fact is that the renal mechanism is peculiarly liable to derangement in pregnant women, which may be associated with that most serious of all obstetrical complications, eclampsia.

Although eclampsia may occur without any apparent alteration in the urine, its approach is usually signalized, it may be days or only hours before its occurrence, by the appearance in the urine of changes characteristic of acute or subacute parenchymatous nephritis—*i. e.*, a diminished amount of urine with decreased total solids, especially urea, the appearance of casts with or without blood in the sediment, and of albumin, varying in amount from a trace to $\frac{1}{4}$ or $\frac{1}{2}$ per cent., or more, according to the severity of the condition. If this condition is not met by prompt and appropriate treatment, symptoms develop closely analogous to those which usher in a uræmic convulsion in Bright's disease. The symptoms especially worthy of note are:

frontal headache, often described as a dull pain behind the eyes, disturbances of vision, severe epigastric pain, recurrence of nausea and vomiting, and general œdema. It is to be remembered that œdema of the lower extremities is of little significance on account of its frequent occurrence in pregnancy in the absence of any renal disturbance, but that œdema of the hands and face is of marked significance.

The œdema rarely needs special treatment, but occasionally becomes so extreme as to cause such distention of the skin as to threaten gangrene or sloughing, especially about the labia and vulvar orifice. Œdema of the vulva must be endured unless it is so severe as to threaten gangrene, in which case it is usually readily relieved by multiple puncture with a surgical needle. This procedure is, however, open to the objection that it may give an opening for infection, and that it usually precipitates labor. Some comfort may be obtained by hot fomentations. Œdema of the feet is best treated by the application of a proper bandage during the day and by elevation of the feet at night. General œdema, if the patient is in good condition, is relieved best by free catharsis obtained by the free use of salines. Further discussion of these symptoms will be postponed to the chapter on eclampsia, it being more conducive to clearness to group the eclampsia of pregnancy, labor, and the puerperium in a special chapter.

Diabetes During Pregnancy. In studying this subject we must differentiate temporary glycosuria occurring from a functional derangement from the constant and perhaps increasing presence of sugar in the urine. During pregnancy as in health sugar is frequently found in the urine, especially after eating, but its appearance is of a transitory nature and need cause no alarm, as it causes no symptoms. It is true diabetes mellitus with which we are concerned.

Diabetes may exist prior to conception, or it may develop during the course of pregnancy. As a rule, unless the condition was present before the occurrence of pregnancy the glycosuria will rarely be diagnosticated until the latter part of pregnancy, for unless the characteristic symptoms are present the urine will seldom be examined for sugar. The complication is either rare or frequently overlooked, for few cases are on record.

After delivery and during lactation glycosuria is quite common, and this fact has created the impression that there exists a distinct causal relationship between the function of the mammary glands and the development of diabetes. True diabetes when complicated by pregnancy is prone to take on a malignant form, so much so that the marriage of a diabetic woman should be strongly discouraged. The symptoms of diabetes are the same as in the non-pregnant state, but the symptoms of pregnancy are intensified. The gastric symptoms are increased and salivation is apt to be extremely exaggerated.

The urine is increased in amount even more than in uncomplicated diabetes. In the few recorded fatal cases death has been due to coma. The question therefore arises: "Shall a diabetic woman be allowed to go to term?" The question is still an open one, as much will depend on the condition of the individual woman. If by careful dietetic treatment the amount of sugar in the urine can be held in check, and if the woman does not show other evidences of constitutional failure, as emaciation, cephalalgia, and drowsiness, she may be allowed to go to term under careful supervision. If the reverse is true nothing is to be gained by temporizing, as the coma may develop at any period of gestation. Even if the patient reaches term it is very doubtful whether the child will survive, and her condition will certainly be aggravated.

Lactation if attempted will simply aggravate her symptoms. If the disease is making progress it is conservative treatment to end the pregnancy after due consultation. In emptying the uterus a rapid method should be employed, since the woman will not stand a prolonged strain.

Vesical Symptoms. During the early months of pregnancy as the uterus enlarges and increases in weight, and before its size is sufficient to lift it out of the pelvis, it not uncommonly presses hard enough on the posterior wall of the bladder to seriously diminish its capacity, and in some cases, undoubtedly aided by reflex influences, produces a marked increase in the frequency of micturition. This symptom, annoying though it is, admits of no treatment, and must be endured. It is only temporary, and relief is usually obtained by the end of the third or middle of the fourth month. From that time on, though moderate frequency is common, it is not usually sufficient to cause complaint until the later months of pregnancy. Between the end of the seventh and beginning of the ninth month the increase in the uterus becomes so great that the bladder is so far forced up into the abdomen as to change its shape from a spherical to a flattened bag. Its anterior and posterior walls are now nearly approximated, and it is so crowded between the uterus and the abdominal wall that its sphincter cannot resist the abnormal pressure, and micturition may exceptionally become so frequent at this time as to occupy most of the patient's attention. No relief can be expected from this distressing state of affairs until after delivery.

In cases in which the bladder has been the seat of a previous infection this distortion may give rise to an acute cystitis.

When cystitis is present it is to be recognized by the characteristic signs in the urine—*i. e.*, alkalinity, early decomposition, and the presence of large quantities of pavement epithelium from the bladder wall. The only treatment usually necessary is the administration of mild alkaline drinks. The following prescriptions are often valuable:

℞.—Pot. brom.,
Pot. chlor. . . . . āā ℥j
Ext. tritici repens . . . . . ʒiv.
Aq. camph.,
Aq. . . . . āā ℥ij.—M.
Sig.—Teaspoonful in water t. i. d.

Or

℞.—Elix. buchu et pot. acet. (N. F.) . . . . ℥iv.
Sig.—Teaspoonful in water t. i. d.

In some severe cases acidulation of the urine is a preferable course. This may be done by the use of—

℞.—Sod. benz. . . . . ℥j.
Aq. . . . . ʒiij.
Sig.—Teaspoonful t. i. d.

Salol is of value in some cases, but in the more obstinate forms urotropin 7.5 grains, t.i.d., gives the best results, or it is permissible to wash out the bladder with a 2 per cent. solution of protargol.

Excoriation. The frequent passage of urine, especially if cystitis is present, may produce excoriations of the vulva and internal surface of the thighs, similar to those caused by an acrid vaginal discharge, which may produce intense pruritus. This is best treated by thoroughly drying the parts with absorbent cotton or some other soft material after each micturition, and then covering them with a stiff ointment. This if carried out thoroughly protects the skin from contact with the urine, and commonly gives prompt relief; but little can be expected unless the instructions are strictly followed out.

Nervous System.

Neuralgias. Pregnant women are peculiarly liable to the functional derangements of sensation commonly known as neuralgia, but it is not known whether this is due to the hydræmia of pregnancy, to an excess in the blood of substances ordinarily excreted in health, such as uric acid, or to some other cause. Any of the sensory nerves may be affected, the most common regions in which the neuralgias occur being those supplied by the trifacial nerve and by the nerves whose origin is in the pelvis.

These neuralgias should be treated on the same principles as in other conditions, with one general reservation—*i. e.*, the neuralgia being dependent on pregnancy, and, therefore, of limited duration, no operative or otherwise radical treatment should be considered.

It is especially necessary to forbid the extraction of any teeth for the cure of persistent toothache during pregnancy, unless the affected tooth, or teeth, is the seat of marked caries, since the only result of extraction would be the shifting of the pain to another tooth, and all the teeth might be extracted without affording any but temporary

relief. Neuralgia of the fifth nerve may be somewhat relieved by the application of heat, or of aconite, camphor, or chloroform liniments, or by the use of the menthol pencil. General measures for the relief of any existing dyscrasia may do more good than local applications.

The use of sedatives, such as morphine and chloral, is in general to be condemned. If morphine becomes necessary it should be given occasionally hypodermically and by the physician himself.

Neuralgias of the nerves which traverse the pelvis, particularly of the great sciatic nerve, are not uncommon during the later months of pregnancy. They may be due to the mechanical pressure exerted on the nerves by the enlarged fœtal head. Treatment is to be conducted on general principles, but will probably give little relief. An attempt should be made to change the position of the fœtal head by postural treatment, in the hope that the removal of pressure will relieve the pain.

These neuralgias are usually limited by the duration of pregnancy, but in some cases they furnish the starting point for a troublesome neuralgia in after-life.

Pruritus. Pruritus, either of the general cutaneous surface or limited to the genitals, may occur in pregnancy without any visible alteration of the skin. When it is general, or confined to the distended abdominal walls, relief may sometimes be obtained by keeping the affected regions covered with cloths wet in a solution of bicarbonate of soda or other alkali, or by prolonged bathing in the same solution.

Application of cloths wet in soap liniment, with chloroform, 1 drachm to 1 ounce, or the application of carbolic acid, 1 to 100, may also give relief, especially if after each application the part is thoroughly rubbed with vaseline.

Pruritus of the genitals, if unaccompanied by any local pathological conditions, should be treated in the same way, but in most cases, even when there is no excoriation, it is due to an acrid discharge.

Any active local treatment is not without its dangers during pregnancy, and the measures described under the head of cystitis should be employed—*i. e.*, thorough drying of the parts, and the application of a stiff vaseline, to which menthol, 10 to 20 grains or more to the ounce, may be added.

If these measures fail and the discomfort is extreme, resource may be had to the bidaily use of tepid vaginal injections, not exceeding ½ to 1 pint in quantity, given very gently. The addition of borax or tannin, 1 drachm to the pint, increases the efficiency of these injections. If this fails the existence of an acrid cervical secretion should be suspected. The cervix should be inspected, and any erosions treated with nitrate of silver. In the absence of visible cervical lesion the application of a light packing of the vagina with dry

cotton covered with aristol or some other similar powder, may afford relief by absorbing the vaginal secretions. No applications to the endocervical mucous membrane are advisable.

Abdominal Pains. When not referable to an imperfect action of the bowels abdominal pains are due either to the stretching of old pelvic adhesions or to some functional disturbances of the abdominal nerves, due to pressure or some other cause. They must be endured, as there is no efficient treatment for them.

Muscular Cramps. Some pregnant women are much troubled by attacks of cramp in the extremities, usually occurring at night. These may often be prevented by general massage administered just before the patient retires for the night.

Insomnia. Insomnia is often a prominent symptom, especially among women of undue nervous development. It should be endured in all cases unless it is evidently causing a distinct deterioration of health, mental or physical. Hygienic measures should be first employed for its relief. Hypnotics should only be used as a last resort, and then very cautiously, owing to the danger of the formation of a habit, which is especially to be dreaded in patients who have shown a tendency to insomnia in the non-pregnant state. The administration of a light meal just before retiring is often of value. Some women sleep well after being treated by massage who do not sleep well at other times.

In case these measures fail and the patient's condition is evidently suffering, recourse must be had to the milder hypnotics, of which the bromides of potassium and sodium are the most commonly used, the bromide of sodium being less irritating to the digestive organs. If either bromide is used it should be given in doses of from 10 to 20 grains, repeated several times during the latter part of the day rather than in one large dose. Trional, grains 5 to 10, about one-half hour before bedtime, is very useful in this condition, but its action though rapid is only transient, and to obtain the best results it should be combined with sulphonal, 5 to 10 grains, the action of sulphonal being slower, but more lasting. Sulphonal alone is slow in its action, and should be given about two hours before bedtime. In obstinate cases with much nervous irritability, especially if marked headache is present, the following mixture is often of great service:

℞.—Pot. brom. . . . . ℥ss.
Chlor. hyd. . . . . ʒij.
Ex. hyosc. . . . . gr. vij.
Aq. . . . . ℥iv.—M.
Sig.—Teaspoonful at 8 P.M. and bedtime.

Mental Condition. The alteration in character and temper, which is not infrequently the cause of great annoyance to the family of a pregnant woman, is a condition belonging to pregnancy and distinctly a symptom of the pregnant state. It is always important to empha-

size this fact to the family, so that they may appreciate the fact that the patient is temporarily irresponsible. It is not very uncommon for a woman who is ordinarily good-natured to become extremely irritable and suspicious, often showing a tendency to avoid her most familiar friends and relations. This is probably due to the fact that self-restraint is easier in the presence of strangers. This curious phenomenon appears most often at about the middle of pregnancy, and increases gradually. It may decrease gradually or disappear suddenly, but if it has once appeared it usually persists till the end of pregnancy. It is always a reason for anxiety, as it may deepen into the insanity of pregnancy, may persist during the whole or the greater part of the puerperium, and does not improve the prognosis for the patient's mental condition in after-life. If a tendency of this sort has appeared and is increasing, the greatest watchfulness should be observed. The patient should be surrounded by cheerful and, if possible, by unfamiliar and impersonal attendants. Every effort should be made to divert her mind from herself and to keep her in public and amused as much as possible without undue fatigue. The nature of the whole affection should be fully explained to her, and she should be urged to do her utmost to control it.

Her physician should direct his efforts toward acquiring her entire confidence, so that there may be at least one person with whom she feels free to discuss all the things which disquiet her, and who is able to give a positive assurance of the imaginary nature of the griefs and embarrassments which surround her. In marked cases it is essential that his visits should be frequent and regular, and it is best that the necessity for such attendance should be explained not only to the husband but to other responsible relatives.

The administration of hypnotics to combat sleeplessness in this condition should be freer than in other conditions, but otherwise no special treatment is necessary.

Cutaneous Affections. Brownish discolorations of the skin of the forehead and other parts of the body (chloasmæ) are not infrequent during pregnancy. They commonly disappear after delivery, and need occasion no anxiety.

Locomotor System.

Distention. During the later months of pregnancy the rapid increase in the size of the uterus produces an increase in the abdominal pressure, which, by elevation of the diaphragm and consequent encroachment on the thoracic space, may produce dyspnœa. This rarely attracts special notice, being usually about equivalent to that seen in chlorotic women.

The rapid increase of weight which is so common at this period may so far disturb the patient's balance as to make her unwieldly

and liable to falls. This is especially likely to occur in cases of multiple pregnancy or hydramnion. When the undue distention comes from multiple pregnancy no treatment is possible unless it becomes so extreme as to call for the induction of premature labor. In cases of hydramnion it requires the treatment proper to that condition.

Relaxation and Softening of the Pelvic Synostoses. Relaxation of all the ligamentous connections of the pelvic bones always occurs in pregnancy, but should normally produce no effect unless it is a factor in the production of the characteristic gait. If the changes are extreme they may cause considerable difficulty in locomotion, which may be decidedly lessened, however, by the application of a proper belt. This should be made of some firm material, as canvas or leather, should not be less than three inches broad, should be applied tightly around the pelvis in the space between the iliac crests and the trochanters, and should be worn also for some time after delivery.

Relaxation of the Abdominal Walls. This is most likely to occur in women who have borne several children within a comparatively short period. It gives rise to the malposition of the pregnant uterus known as anteversion. In extreme cases the fundus may reach a position below the symphysis or even rest upon the thighs, this being rendered possible by distention of the tendinous median raphe and overlying skin after separation of the recti muscles. It is productive of much fatigue and dragging pain, but may be readily relieved by the application of a proper belt. The essential points in the application of this belt are that it should be drawn tightly around the pelvis in the space between the iliac crests and trochanters, and that it should reach high enough in the back to give firm support to the abdomen.

CHAPTER VII.

INTERCURRENT DISEASES OF PREGNANCY.

PREGNANT women are equally liable with other people to contract the ordinary diseases to which they are exposed, and since a large proportion of these diseases either exert a baleful influence on pregnancy, or are altered for the worse by it, it is important that every obstetrician should have a definite knowledge of the relations between general disease and midwifery.

ACUTE INFECTIOUS DISEASES.

Continued high temperature is in itself unfavorable to the continuance of pregnancy, but the amount of effect observed depends greatly on the nature of the infection in the individual case.

Variola. Smallpox, if occurring in a pregnant woman who has not been vaccinated, tends to run a malignant course, being especially prone to assume the hemorrhagic type. In this class of cases both patients are usually lost. In women who have been vaccinated the type of the disease is apt to be mild, and both patients may be saved. Even if the mother survives a severe attack the child is usually lost. Vaccination may be performed with safety during pregnancy, should any indication arise, under the same precautions as at other times, and usually is an efficient protection for both mother and child.

Scarlet Fever. Scarlet fever is a very grave complication of pregnancy and is usually fatal to the child, even if the mother survives. The death of the child, of course, always produces miscarriage. In mild cases the prognosis for the mother is but little altered by pregnancy, except for the increased danger of scarlatinal nephritis. In severe cases the exhaustion of a probable miscarriage, the liability to scarlatinal nephritis, and the common occurrence of septic infection of the pelvic organs make the prognosis decidedly grave. Labor should not be induced.

Rubeola. Measles is a rare complication of pregnancy, since the majority of women have had it during childhood. If it occurs it is apt to take on the hemorrhagic type and is apt to be followed by pneumonia as a sequela, in which case the prognosis for the mother becomes the prognosis of pneumonia complicating pregnancy.

The prognosis of uncomplicated measles is good for the mother, but the fœtus is apt to be lost during the course of the disease. Abortion is a complication to be dreaded.

Erysipelas. Erysipelas in pregnant patients is a grave complication in proportion as it attacks the genital tract or remains limited to some other portion of the body. For instance, when erysipelas is limited to the face, pregnancy may terminate without any infection of the uterus. Strict antiseptic precautions must be observed in all cases, if infection of the uterus is to be avoided.

Erysipelas about the genital tract or lower extremities almost always results in puerperal infection. Labor is usually premature in these cases. The fœtus may be infected before birth.

The treatment of erysipelas during pregnancy consists of rest, tonics, stimulants, and careful covering of the affected areas with antiseptic dressings. If this is thoroughly carried out the danger of infection of the uterus during labor will be decidedly lessened.

Malarial Fever. Malarial fever is apt to complicate seriously the pregnant state, the tendency to abortion depending on the severity of the process. There is no reason why quinine should not be used in the treatment of malaria during pregnancy, as there is no evidence of its power to initiate uterine contractions, though it may perhaps strengthen them if they have already begun.

Typhoid Fever. The occurrence of this disease during pregnancy is followed by miscarriage in the vast majority of the severe cases, the long-continued pyrexia exerting a very unfavorable influence on the life of the child. This is not an absolute rule, however, as some very severe cases recover and go to term without trouble.

The prognosis for the mother is only altered by the fact that to the exhaustion of the disease the exhaustion of parturition is superadded. This may be sufficient to turn the scale, and the prognosis alters for the worse in proportion to the advancement of pregnancy. The question always arises, "Shall labor be induced?" on the ground that miscarriage is practically sure to follow except in mild cases and that it should preferably be induced at a time when the patient is in fairly good condition. It is by no means certain, however, that the fœtal life will be lost, as there are several cases on record in which the patient has been delivered at term of a living child after passing through a severe attack of typhoid early in pregnancy.

The shock of a prolonged and difficult induction of labor is extremely apt to prove fatal to the mother, and it is often the most conservative treatment to consider the patient merely as a case of typhoid fever and treat her as such, ignoring the existence of pregnancy in treatment unless abortion occurs spontaneously. This will be accomplished with much less harm to the patient than an induction of labor. The continued high temperature being a great factor in the production of miscarriage, the importance of thorough treatment

by hydrotherapy to reduce the temperature is of even greater importance than in ordinary cases of typhoid.

Pneumonia. Acute lobar pneumonia is a complication to which the pregnant woman seems to be more susceptible than the non-pregnant woman. It is very fatal to the child, and the prognosis is made more grave for the mother in proportion as the advancement of pregnancy encroaches more and more on the thoracic space. The attitude of the physician should be passive in regard to the pregnancy, as it will avail nothing for either mother or child to induce abortion or premature labor. If either begin spontaneously the prognosis becomes worse for the mother on account of the added strain on her already overburdened heart and lungs.

Pleurisy. Pleurisy exerts little or no influence on the course of gestation, and, conversely, the progress of a case of pleurisy is unaltered by the co-existence of pregnancy.

Tuberculosis. Tuberculosis, whether thoracic, abdominal, or general, even in the advanced stages, exerts but little influence on the course of pregnancy. Pregnancy, on the other hand, is almost invariably followed by a rapid increase in the tubercular process. In many cases an apparent improvement takes place in the patient's general condition during the later months of pregnancy or immediately after delivery. This improvement is usually only temporary, and delivery is in most cases followed by rapid progress of the disease to a fatal termination. Labor is usually easy and rapid in phthisical patients on account of the laxity of the soft parts, but in advanced cases attended with dyspnœa immediate delivery is indicated as soon as the os is sufficiently dilated.

The prognosis for the child is not very good, as in many cases it is weak, small, and poorly nourished; but in some cases its nutrition is curiously good, in spite of the extreme emaciation of the mother, the child evidently having been nourished at the mother's expense.

The induction of labor is rarely justifiable, as patients in an almost hopeless condition deliver themselves with great ease.

Phthisical women should be advised against marriage, and, if married, should be cautioned to avoid pregnancy on account of the probability of bringing on an extremely rapid increase in the disease. Since the disease is not transmitted in utero, a phthisical mother should not be allowed to nurse her child, and every precaution to guard against subsequent infection of the child should be taken.

Patients previously healthy, but with hereditary predisposition to phthisis, not infrequently develop the disease during pregnancy or shortly afterward.

Cardiac Disease. When a woman with organic disease of the heart becomes pregnant she should always give her physician great concern. When we remember that normally the heart bears additional strain during pregnancy, the left ventricle especially becoming

hypertrophied to meet it, it is easy to understand that a heart already crippled may be unable to bear the added burden. An additional hypertrophy fortunately usually compensates the lesion, especially in cases which are not of an aggravated type.

Acute endocarditis tends to become ulcerative and often proves fatal. Women suffering from chronic endocarditis are rarely able to stand the added strain of gestation, since, as a rule, the woman is made comfortable only by the compensatory hypertrophy which has already taken place, and the already overworked heart is unable to stand the increased arterial tension consequent to pregnancy. Not infrequently, although gestation may have been passed through safely, the woman dies during or immediately after labor, the heart being unable to accommodate itself to the sudden changes in vascular tension which occur during labor.

In cases of chronic endocarditis the extent of the disturbance will depend on the site of the lesion and upon the amount of injury to the valves. Mitral stenosis is the most serious lesion, then come the aortic lesions, while mitral insufficiency is the least serious.

In the aortic lesions the symptoms are often marked during the early months of pregnancy. The patient will suffer from dyspnœa, a dry, hard cough, and occasionally from hemorrhages from the lungs, stomach, gums, or nose.

When the cardiac lesion is not of an aggravated type the woman may go to term and the symptoms first manifest themselves during labor, or then become much exaggerated, and syncope and cardiac paralysis may ensue.

When the mitral valve is affected, if the lesion is slight and compensation complete, there may be no cardiac symptoms unless an acute exacerbation occurs; but pregnant women with cardiac disease are peculiarly liable to fresh attacks of endocarditis on exposure to cold or on overexertion. Compensatory hypertrophy may enable the patient to bear the strain of pregnancy during the early months, but even then she may without special warning develop a rapidly fatal pulmonary œdema. The effect on the fœtus in aggravated cases is such that it often dies in utero, or is feeble and poorly nourished, and succumbs at an early date after birth.

While not an absolute contraindication to marriage, cardiac disease is badly affected by each succeeding pregnancy. Thus a woman in an early stage of the disease may pass through her pregnancy and labor without any untoward symptoms. Each succeeding pregnancy aggravates the lesion, so that, as soon as compensation seems to fail, it is dangerous for the woman to conceive again. The prognosis should always be guarded. Pulmonary œdema and embolism are the two complications most to be feared.

TREATMENT. Since when the cardiac lesion is aggravated the infant rarely survives, even though the woman is carried along to

term, we are not justified in jeopardizing the mother's life in order to give the child a very problematical chance.

Rest, freedom from care, and the free use of iron, digitalis, and strychnine are all of great value in preventing an increase of the trouble and in tiding the patient along until her pregnancy reaches its natural termination.

The broad rule may be laid down that where compensation is inadequate, or secondary dilatation has set in, nothing will be gained by trying to tide the woman along to term.

Induction of premature labor may be necessary. At term every means should be employed to shorten the duration of labor. An early resort to operation is far better for the patient than the exhaustion of a long and tedious labor.

Cholera. The prognosis of cholera is made worse by the coexistence of pregnancy, but its treatment is unchanged. The duration of the disease is so short that the patient is either dead or has recovered before abortion can take place. Statistics show that one-third to one-half of the patients recover, and that about one-half of these abort later, so that the fœtal prognosis is bad, the children being born dead even if the stage of viability has been reached.

Icterus. Jaundice may occur during pregnancy, and conforms to one of two types—a mild catarrhal form with mild symptoms, or the so-called severe icterus of pregnancy, with severe symptoms from the start, rapid pulse, and early exhaustion. The mild form is unimportant and exerts no influence on pregnancy. The severe form always causes abortion, followed by severe and usually fatal collapse. The diagnosis can only be made clinically after some little time, and then the two forms are only distinguished by their severity. The treatment is symptomatic, and is that of jaundice in the non-pregnant state.

Chorea. Chorea is not very frequent during pregnancy, and affects usually those women who have had attacks during childhood. It is more common in primiparæ than in multiparæ.

It is probably brought on by the lowered nutrition of the nervous system incident to the hydræmia of pregnancy. The attack usually begins during the early months of pregnancy and ceases gradually after delivery. Abortion and premature labor are common. The prognosis is grave and must always be guarded.

In fatal cases death is due to the exhaustion caused by muscular exertion. Treatment consists in securing absolute rest, mental and physical, for the patient, and careful feeding, and the administration of arsenic and iron in full doses. Abortion is indicated in severe cases when the mother's condition is failing, as otherwise both lives will be sacrificed.

Syphilis Syphilis, when acquired during gestation, is apt to be of a severe type. The virulence of the local lesions depends not only on the severity of the syphilis, but also upon the septic infection

which is frequently present also. When infection occurs at conception the course of the disease is apt to be very malignant, especially if complicated by sepsis. Abortion is very common in syphilitic patients, but Fournier states that a syphilitic woman who becomes pregnant is more apt to abort than a pregnant woman who becomes syphilitic.

The earlier the infection occurs during pregnancy the greater is the probability of abortion. If infection occurs during the first four months of pregnancy abortion is the rule. Fifty per cent. of the children are lost if infection occurs from the fourth to the sixth month. Seventy-five per cent. in all are lost. The mother's health is greatly impaired by specific infection during pregnancy, and the disease is apt to run a very severe course, with marked mucous lesions.

About 5 per cent. of pregnant women in the larger cities are said to be already syphilitic, and in them we are principally concerned with the prognosis for the child. Children may be born apparently healthy from syphilitic mothers, and, conversely, children showing definite lesions may be born of women who themselves show no sign of syphilis as a result of inheritance from their fathers. In successive pregnancies of untreated syphilitics, abortion is apt to occur at later and later periods of gestation until finally a living child is born which may present unmistakable evidences of the disease, or may be apparently healthy.

TREATMENT. From the time conception is suspected in recognized syphilitics a systematic administration of the iodides and mercury gives the only basis of hope of a living child. The same holds true, though with less hope, in cases of syphilis acquired during pregnancy. In women who have suffered from repeated abortions without recognizable cause syphilis should always be suspected, especially if a history of previous syphilis can be obtained from the father, since abortion then not infrequently occurs without manifestations of syphilis in the mother, probably as the result of fœtal disease.

Hysteria. Hysteria does not affect the progress of pregnancy in any way, but may itself be decidedly affected by pregnancy. It is probable that in those instances where the hysteria is due to an imperfect development of the generative organs it may be ameliorated or even cured by the supervention of pregnancy, owing to the increased nutrition of these organs which occurs during pregnancy. In the cases which depend on the nervous instability of the patient, pregnancy only serves to increase the hysteria, and repeated pregnancies are to be feared, as their accompanying exhaustion diminishes still further the impaired self-control of the patient.

CHAPTER VIII.

OBSTETRICAL COMPLICATIONS OF PREGNANCY.

HEMORRHAGE DURING PREGNANCY.

HEMORRHAGE during pregnancy always suggests one of the following conditions: placenta prævia, hydatidiform mole, extra-uterine pregnancy, or threatened termination of gestation.

Placenta prævia belongs more especially among the accidents of labor, and will be discussed in a special chapter under that heading.

Hydatidiform Mole (Vesicular Mole, Molar Pregnancy, etc.).

Hydatidiform moles are formed by a cystic degeneration of the chorionic villi, and their metamorphosis into a multitude of small cysts, joined together in grape-like clusters by slender, very vascular stalks, and containing a thin, gelatinous fluid. This degeneration usually takes place during the first three months of pregnancy, before the formation of the placenta, in which case it arrests the development of the fœtus, which is subsequently absorbed, while the mole in the course of its growth fills the entire uterine cavity. Very exceptionally the mole may develop at a later period after the formation of the placenta. In this case the development of the fœtus may go on alongside of the mole for a time, which is dependent on the extent of the involvement of the placenta in the degenerative process. Instances have been reported in which, in twin pregnancy, one chorionic sac was completely filled with mole while the other contained a healthy fœtus. (Fig. 33.)

FIG. 33.

Hydatidiform degeneration of the chorion. (LEISHMAN.)

The rapid distention of the uterus which is the result of the growth of the mole is usually resented by that organ, and results in premature delivery at a time when the uterus has about reached the size of a

six months' pregnancy, but in rare cases the tumor reaches the size of a full-term uterus. The liability to serious hemorrhage increases in proportion to the size of the uterus. Hydatidiform mole is, however, a very rare complication, one observer reporting only one case in twenty thousand deliveries, others a frequency of one in every thousand.

SYMPTOMATOLOGY. The most distinctive sign of the existence of a hydatidiform mole is the rapid increase of the uterus to a size greater than would belong to the estimated period of gestation, together with a peculiar and characteristic elastic, doughy feel of the fundus. Marked sacral and bearing-down pains and general pelvic discomfort are usually present, combined with the other signs of rapid distention of the uterus.

As a rule, there are occasional discharges from the vagina of a thin, pink, serous fluid, most often at the times corresponding to the menstruation. This discharge is a mixture of water and blood, and may contain cysts from the tumor. If the cysts are found in the discharges they are absolutely diagnostic.

DIAGNOSIS. A size of the uterus too great to correspond with the estimated duration of pregnancy should always immediately excite a suspicion of hydatidiform mole.

The hemorrhage due to a hydatidiform mole may generally be differentiated from the hemorrhages due to placenta prævia by the fact that they usually begin during the first three months before the placenta is formed, and during the later months by the fact that the discharge in placenta prævia consists of pure blood, while in this condition it is a mixture of blood with water. The non-existence of a fœtus, in spite of the fact that the size of the uterus corresponds to a five or six months' pregnancy, may be determined by the absence of ballottement. This sign becomes strongly suggestive when the uterus reaches the size of a six months' pregnancy. At a later period the absence of the fœtal movements and fœtal heart sounds also furnishes evidence, though the movements may be closely simulated by irregular contractions of the uterine muscles.

PROGNOSIS. In cases where an early diagnosis is made and proper treatment instituted the prognosis for the mother is generally good; but the greater the size of the mole the greater the danger of profuse hemorrhage during delivery, and the graver the prognosis. The prognosis for the fœtus is bad in any case, so that interference is to be advised as soon as the diagnosis is made.

TREATMENT. Labor should always be induced as soon as possible after the diagnosis is established, for the danger of a serious or fatal hemorrhage is always present. If the diagnosis is not made until after the beginning of labor every possible means should be taken to expedite delivery. The choice of the methods to be adopted to hasten labor depends mainly on the rigidity of the cervix and the size of the uterus.

If at the time operation is decided upon the rigidity of the cervix is such as to render its dilatation prolonged and difficult, it may be better to defer operation until the cervix has become softened by labor, which, if present, may be expedited, or, if absent, should be induced by any of the other means recommended for the induction of artificial miscarriage.

Should hemorrhage occur during the early stages of dilatation it may be checked by the vaginal tampon, if the size of the uterus is smaller than is proper to the fifth month of pregnancy. After this the danger of hemorrhage into the cavity of the uterus (internal concealed hemorrhage) is so great that the use of the tampon is inadmissible.

Even prior to this time the danger of hemorrhage behind the tampon is so great that it may be laid down as an absolute rule, that if labor has begun the physician should never leave the bedside of a patient with hydatidiform mole until delivery is accomplished. Throughout the progress of the case the pulse should be carefully watched so that any sign of internal concealed hemorrhage may be instantly noted and a more active method of procedure adopted.

The tampon should be removed as soon as any increase in the pains renders it probable that the cervix has become softened and that dilatation has reached a point which will permit the emptying of the uterus. In cases where the size of the uterus exceeds that of a five months' pregnant uterus, rigidity of the cervix is less common, and the danger of concealed hemorrhage after the introduction of the tampon is so much increased that it is safer, as a rule, to proceed at once to the manual dilatation of the cervix under anæsthesia, in the manner described later for the induction of premature labor at term, rather than to trust to any of the slower methods.

As soon as the size of the os permits the passage of the fingers, the contents of the uterus should be withdrawn by the method used in the manual removal of the secundines after miscarriage.

When hemorrhage occurs during the dilatation the chief indication is for haste in emptying the uterus, since no diminution in the bleeding can be hoped for until the growth is entirely removed, and when the uterus is once empty the danger of hemorrhage usually ceases.

In case, however, hemorrhage persists after the apparently thorough removal of the growth, the uterus should be lightly curetted with a blunt wire curette, and then packed with gauze. The delivery may wisely be followed by the administration of a drachm of the fluid extract of ergot, and should always be followed by an intra-uterine injection for the removal of blood-clot.

If the hemorrhage has been sufficient to cause collapse this should be treated according to the ordinary surgical rules for such cases.

Extra-uterine Pregnancy.

Extra-uterine pregnancy, or ectopic gestation, is that condition in which the impregnated ovum is developed outside of the uterine cavity. The location of this abnormal development may be in the undeveloped cornu of a bicornate uterus, in that portion of the Fallopian tube which lies in the uterine wall, or in the free portion of the tube. Whatever the original site of the ovum, it may be discharged into the abdominal cavity by rupture of the walls which surround it, and continue its development to term in its new position if the patient survives the shock and hemorrhage which attend the rupture; or it may be discharged into the cavity of the broad ligament, and perish or continue its growth there according to the site of the rupture in the tube. (Fig. 34.)

FIG. 34.

Tubal pregnancy, with the corpus luteum in the ovary of the opposite side. The decidua is represented in the process of detachment from the uterine cavity. (PLAYFAIR.)

ETIOLOGY. The etiology of extra-uterine pregnancy is not definitely known. It occurs in both primiparæ and multiparæ. It is ordinarily considered to be most common in women who have previously suffered from salpingitis or in whom a congenital narrowing of one or both tubes exists. This is not, however, clearly established, and can only hold for slight inflammations, since any marked inflammatory changes in the tubes would make it impossible for the ovum to develop there.

DIAGNOSIS. The diagnosis is often difficult, and sometimes impossible, before rupture of the tube occurs. It rests on the conjunction of the signs and symptoms of pregnancy, with a physical examination which shows the uterus to be slightly enlarged and a mass outside of it. When rupture occurs, a sudden, unexplained collapse, with the signs of internal hemorrhage, is added to the foregoing conditions.

Diagnosis Before Rupture. When all the signs and symptoms are present the diagnosis is easy, but they are often largely absent. A list of the signs which may be expected are: the omission of one or more menstrual periods; the characteristic mammary and other symptoms of pregnancy; the enlargement of the uterus, though to a less degree than in normal pregnancy; the discharge from the uterus of decidual shreds, and at times a more or less marked bloody discharge; the progressive growth of a tumor in one broad ligament, accompanied in most cases by attacks of sharp, intermittent, cramp-like pains, occurring at irregular intervals, and usually referred to one ovarian region; and in rare cases the discharge of a complete decidual cast from the uterus. When this occurs it furnishes on microscopical examination pathognomonic evidence of the condition in the presence of chorionic villi. It differs on clinical inspection from the membranes of a blighted ovum in being triangular in outline—*i. e.*, of the shape of the cavity of the unimpregnated uterus.

The most constant symptoms are: the omission of at least one menstrual period; the fact that the patient believes herself pregnant; and the characteristic pains in the ovarian regions.

The uterine changes in these cases differ in a marked degree from those of normal pregnancy. The uterus enlarges until the third or fourth month, after which it becomes stationary. The enlargement of the body is much less than in normal cases, while the cervix remains longer and firmer.

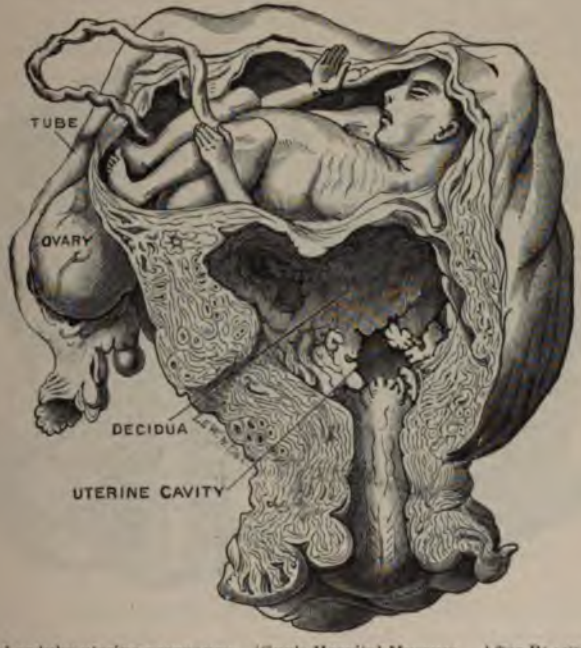
Diagnosis After Rupture. When a woman who has been exposed to pregnancy is attacked by severe pain in the abdomen, accompanied by a slight bloody discharge from the os, and succeeded by a sharp collapse, with the symptoms of internal hemorrhage, the chances are enormous that she is suffering from a ruptured extra-uterine pregnancy, and in most cases these symptoms are a sufficient warrant for the performance of an immediate laparotomy. Every care should, however, be taken to confirm the diagnosis by means of the history and by a thorough pelvic examination.

Interstitial Pregnancy. When the impregnated ovum lodges in the interstitial portion of the tube or in an undeveloped cornu of a bicornate uterus, the following results are possible: rupture almost always occurs before the sixth month, and the ovum is discharged into the abdominal cavity or into the cavity of the broad ligament, according to the site of the rupture. The ovum may, however, occasionally escape into the uterine cavity, and there may either be expelled at once or go on to term and be born in the usual way. (Fig. 35.)

If the rupture takes place into the abdominal cavity a fatal result almost invariably follows promptly from the hemorrhage and shock which ensues. The only differences between interstitial and ordinary extra-uterine pregnancy are: the possibility of the so-called tubal

abortion—*i. e.*, the discharge of the ovum into the uterine cavity; an increased difficulty in the diagnosis on account of the intimate connection of the adventitious tumor with the uterus, and the fact that the increased thickness of the tubal walls in this location ordinarily permits the ovum to reach a greater degree of development before rupture occurs, which renders the prognosis for the patient at the time of rupture even worse than in the ordinary form, as the initial hemorrhage is apt to be greater. If rupture takes place into the broad ligament the prognosis is unchanged from that of an ordinary tubal pregnancy which ruptures in this location.

FIG. 35.



Interstitial or tubo-uterine pregnancy. (Guy's Hospital Museum. After BLAND SUTTON.)

The indications for treatment in the cases of interstitial pregnancy differ in no particular from those which obtain in the ordinary tubal form—*i. e.*, immediate operation as soon as the diagnosis can be made.

Tubal Pregnancy. In the tubal variety of extra-uterine pregnancy the ampulla is the most common site for the development of the ovum. Owing to the comparative thinness of the walls of this portion of the tube rupture usually occurs at some time during the first three months of gestation. (Fig. 36.)

With the development of the ovum the walls of the tube in which it lies become stretched more and more until rupture finally occurs. This is accompanied by sudden and severe pain, with shock, and at

times hemorrhage from the uterus. The pulse is rapid and feeble; the respiration rapid and shallow; the patient is pale and drawn-looking; the extremities are cold; and death seems impending—in other words, the ordinary signs of internal hemorrhage combined with severe shock rapidly develop. The location of the rupture is very important in determining the result in these cases. If the rupture is so situated that the ovum escapes between the folds of the broad ligament the amount of hemorrhage which can occur is limited by the walls of the ligament anteriorly and posteriorly, and by the peritoneum above, the blood clots, a hæmatoma develops, and under proper treatment the patient will gradually recover from the shock. If, however, rupture occurs into the general peritoneal

FIG. 36.

Tubal pregnancy. (After a specimen in the Museum of King's College. PLAYFAIR.)

cavity, there is no barrier to check the flow of blood, and the hemorrhage continues until the patient dies in a state of collapse, which follows rapidly unless surgical aid is promptly obtained.

Abdominal Pregnancy. If the rupture occurs in such a manner that the ovum escapes among the intestines, and the patient survives the initial hemorrhage, peritonitis may develop, and the hemorrhage be limited by an exudate. The ovum may then continue to develop in its abnormal location, but development to term can only take place when the placenta is so implanted that it finds suitable space and nourishment for its continued growth. It is only in the abdominal cavity that the development can go to full term. (Fig. 37.)

As the development goes on, the signs and symptoms of extra-

uterine pregnancy undergo changes. As the ovum grows, the pelvic tumor may ascend at one side of the pelvic brim and be easily felt on palpation. The fœtal heart sounds become audible on auscultation at the same period as in normal pregnancy. In many cases the fœtus lies directly under the abdominal walls, and its outlines may be more easily mapped out and its heart sounds more plainly heard than in normal cases. If the fœtus reaches term and is not removed by surgical means, it will die from atrophy of the placenta, and may then be expelled from the abdominal cavity by various channels or be retained in the patient's body during her life. Unquestionably, the most common termination of such a case is the infection of the fœtal sac with bacteria and the death of the mother from septic absorption, unless surgical relief is afforded, as occurs in any other form of abdominal abscess, but in rare cases more favorable results

FIG. 37.

Uterus and fœtus in a case of abdominal pregnancy. (PLAYFAIR.)

may follow. The tissues of the fœtus may become calcified and a lithopædion be formed. In other cases the fœtus may undergo mummification and be transformed into a parchment-like substance. In still other cases the fœtal parts may be enlarged and changed into a fatty substance known as adipocere.

In a comparatively rare group of cases the fœtus may act as a foreign body within the mother and be expelled by ulceration. It may in this way be expelled through any of the neighboring organs, the rectum, vagina, or bladder, or even through the abdominal wall, usually in the region of the umbilicus.

PROGNOSIS. The prognosis for the mother in extra-uterine pregnancy is bad unless operative interference is resorted to. Hemorrhage, shock, and infection make the mortality in unoperated cases extremely high. The prognosis for the fœtus is almost uniformly

bad, there being, however, a few cases in which a fœtus has been delivered at term by abdominal section, and has survived.

TREATMENT. *Before Rupture.* The treatment of extra-uterine pregnancy is wholly surgical. If the physician makes his diagnosis before the rupture of the sac takes place, the only indication is for the removal of the ovum and the tube which contains it by a laparotomy, and that at the earliest possible opportunity, as the rupture may occur at any time. (Fig. 38.)

After Rupture. When rupture of an extra-uterine pregnancy has occurred, the treatment which offers the best chance for the patient

FIG. 38.

Unruptured tubal gestation, with apoplexy of ovum. (CULLINGWORTH.)

a. Tubes. *b*. Brain cavity. *c*. Vertebral column. *d*. Fœtus. *e*. Cyst. *f*. Membrane lining interior of cavity. *g*. Ovary. *h*. Clot. *i*. Oblique cut through tubes. *j*. Uterine end of tube.

again consists in immediate abdominal incision, ligation of the bleeding tube, and its complete removal, together with the ovary and ovum. While it is true that cases of recovery take place by spontaneous and gradual cessation of the hemorrhage, the risk of a fatal issue is so great in unoperated cases, that when operation is possible it should always be done with the least possible delay. If the condition of the patient, or other circumstances are such that immediate operation is impossible, the duty of the physician is to watch the patient with unremitting care, and to make the necessary prepara-

tions for the performance of the operation at the earliest moment when it becomes possible. In such cases the patient must be kept absolutely quiet. There being no drug which will control arterial hemorrhage, the patient's best chance lies in absolute quiet, in the hope that the rupture is within the broad ligament and that a clot will form and gradually check the hemorrhage. Should this occur, the pulse will improve and the patient's strength rapidly return. The effusion of blood into the peritoneal cavity may then result in the setting up of an adhesive peritonitis, which would then help to check the bleeding. If such a patient be examined a few days after the hemorrhage has ceased, a large doughy mass will be found in the pelvis. This will gradually be absorbed unless it becomes infected.

The use of cardiac stimulants to sustain the failing pulse during the progress of a hemorrhage from the ruptured tube is to be forbidden until the bleeding is controlled, since except in operative cases the only hope for the patient lies in the formation of a clot and self-limitation of the hemorrhage, and any drug which strengthens the heart action increases the tendency to hemorrhage.

Immediate operation is the safest and best treatment, and should always be insisted on when it can be performed. In cases of abdominal pregnancy—*i. e.*, when the development of the fœtus has continued in the abdominal cavity after its discharge from a ruptured tube, some observers counsel delay until, by the death of the fœtus and the partial separation of the placenta from its attachments, the risk of serious hemorrhage at the time of operation is much diminished. This danger is probably balanced by the risks of septic absorption from the dead child and placenta. It therefore sacrifices the life of the child without lessening the risk to the mother in any marked degree. It is probably better practice to allow the pregnancy to continue to term, and the child should then be removed through an abdominal incision made over the centre of the tumor.

The operation in abdominal pregnancy is not without serious risks. If the pregnancy has advanced to a point when the fœtus is of considerable size, the placenta is correspondingly developed, and is firmly attached to the intestines, the omentum, mesentery, or the walls of the pelvis. The effort to separate the placenta from its attachments is attended with grave risk of fatal hemorrhage, since there is no mechanism for closing the sinuses when so situated. In exceptional cases it may be so situated that the tissues to which it is attached can be ligated and the whole mass removed together, hemorrhage being completely under control. This might happen if the site of its attachment were the omentum or the broad ligament. In most cases, however, the operative procedure must be something as follows: The fœtal sac is opened at its most dependent point; the fœtus is at once removed and the cord ligated and cut; the fœtal sac should then be completely emptied of amniotic fluid, the peritoneal

cavity having been carefully walled off before the sac was opened. A careful examination should then be made to determine the possibility of immediate removal of the placenta. In case any doubt exists, the cord should be ligated and cut off close to the placenta. The membranes should be stitched to the edges of the abdominal incision and the amniotic sac tightly packed with sterile gauze, the placenta being left undisturbed. The pressure of the packing prevents serious hemorrhage, the placenta becomes loosened gradually, and comes away, sometimes piecemeal and sometimes nearly whole, and an abdominal sinus is left which will close in time. If infection of the peritoneal cavity does not occur, the patient has a fair chance of recovery after this procedure.

In cases where the fœtus is dead or partially decomposed, no effort should be made to remove any more of the placenta than is already detached and comes away spontaneously. The amniotic sac should be packed with gauze and the placenta allowed to come away gradually.

In rare cases where the fœtus has developed between the layers of the broad ligament, it may be possible by making a lateral incision, to remove the fœtus without opening the peritoneal cavity. If the placenta separates readily it may be quickly removed and the cavity packed with gauze, but the danger of overwhelming hemorrhage is very great.

In the majority of cases it will be found adherent, and the method of allowing the gradual separation and removal of the placenta is to be employed. Recovery will be slow, and the persistence of an abdominal sinus for some time will prove annoying to the patient, but this is of little importance. The children born from extra-uterine pregnancy are usually small and feeble, and require the same careful attention that a premature infant demands.

Although the operation seems incomplete when the placenta is left *in situ*, this expedient has reduced the mortality greatly in these cases, since experience has shown that fatal hemorrhage usually follows the attempt to remove it.

In no condition has modern obstetrical surgery had better results than in extra-uterine pregnancy. In cases where the diagnosis is made early and immediate operation performed, the prognosis is good.

Abortion, Miscarriage, and Premature Labor.

Premature terminations of pregnancy are usually divided according to the time of delivery: into abortions, those which occur during the first three months of pregnancy, or until the placenta has become formed; miscarriages from the end of the third until the end of the seventh month, or from the formation of the placenta until the fœtus

has become viable; and premature labor after that period. Popular use, however, has limited the term abortion to operative inductions, and extended miscarriage to cover the whole subject.

Miscarriage.

The symptoms of a threatened miscarriage are the presence of a sense of uneasiness, weight, and dragging in the back or pelvis and in the suprapubic region, and the occurrence of hemorrhage and of uterine contractions. Treatment divides itself naturally into prophylaxis, the treatment of threatened and the treatment of inevitable miscarriage.

Prophylaxis. Two factors enter into the causation of miscarriage: a predisposing and an exciting cause. It is probable that some pathological condition exists in most women who miscarry without a special reason, for nothing is more striking than the contrast between the accidents and injuries which some women sustain without the slightest influence on the course of gestation and the trivial causes which produce miscarriage in others. It is probable that miscarriage is usually preceded by a separation of the decidua from the uterine wall or by some pathological alteration in the fœtal envelopes, and that separation between healthy decidua and the uterine walls is unlikely to occur, while on the other hand it is easily produced in the case of membranes whose condition has been altered by some pre-existing disease or in the presence of great uterine congestion.

Predisposing Causes. The conditions which are the more common predisposing causes of miscarriage are: syphilis, profound anæmia, malpositions of the uterus, and the so-called habit of abortion, which is, however, in all probability due to a pre-existing endometritis or some other gynecological lesion.

Syphilis. In a case where either parent has been at any time syphilitic, the administration of a course of mercurial treatment will frequently prevent miscarriage. Since repeated arrests of pregnancy are the rule with syphilitic patients, even after the complete disappearance of all other symptoms of the disease, this treatment should be perseveringly administered in any case in which a history of syphilis can be obtained.

Malposition of the Uterus. Any marked displacement of the uterus is likely to be accompanied by a congestion so intense that the tendency to miscarriage is much increased. Any malposition which is discovered during pregnancy should be at once corrected, under anæsthesia, if necessary, and a suitable support adjusted to retain the uterus in its proper position. Although the proper and guarded use of pessaries at this time is unattended by marked risk, they must be frequently inspected to guard against setting up an irritation of the vagina which might be enough of itself to produce miscarriage.

They should be always removed in the fourth or fifth month, since by that time the increased size of the uterus renders a return of the displacement unlikely, and their usefulness is ended.

Habitual Miscarriage. The use of the term habitual miscarriage is in itself a confession of ignorance, since the habit is undoubtedly always dependent on the existence of slight local variations from the normal condition. If such a patient comes under observation in the non-pregnant state, every effort should be made to discover and correct any pelvic abnormality which may be present. Malpositions should be rectified and pelvic exudates subjected to proper treatment. The most common and most easily overlooked causes are the minor degrees of endometritis and excessive congestion of the uterus and other pelvic organs.

Endometritis may be detected by finding slight enlargement and increased tenderness of the uterus, with increased uterine secretion and a slightly patulous condition of the internal os. In case of doubt, if a dry tampon be placed over the external os, sustained in position for twenty-four hours by a light packing, and then removed, microscopical examination of the secretion found on the cotton may show the presence of an endometritis.

If endometritis is present a thorough curettage, followed by the use of copious douches of hot water in the recumbent position, will ordinarily result in a cure. Where intense pelvic congestion exists and miscarriages succeed each other with marked rapidity, mere abstinence from connection for a period of from three to six months may be sufficient to upset the tendency to miscarriage; but if this expedient is unsuccessful a course of pelvic depletion must be instituted.

When a patient who has had repeated miscarriages applies for treatment after the beginning of pregnancy, all that can be done is to enjoin the most extreme precautions against the ordinary exciting causes. In addition to the ordinary precautions, coitus should be forbidden, and the patient should be urged to remain absolutely quiet in bed during that week of each month in which menstruation would naturally have occurred; and if the previous miscarriages have taken place at a definite period of the pregnancy, the same absolute quiet should be advised for some weeks about that time, as it is a fact that if the patient can be tided over the ordinary time of miscarriage she is likely to go on to term.

Exciting Causes. Among the immediate causes of miscarriage which all patients should be cautioned to avoid are the straining caused by excessive constipation, by severe vomiting, or by violent coughing, and the jar of a misstep or a jump or a fall, or of a long railroad journey.

Miscarriage is frequently caused by lifting heavy weights, by an attempt to place some light object on a high shelf or hook, and occa-

sionally by blows on the abdomen. A pregnant woman should always be cautioned not to hang up her own dresses, to avoid lifting her children, if she have any, and to guard against allowing them to strike her abdomen during play or during fits of ill-temper.

Long railroad journeys should be avoided, if possible, especially at the times when menstruation would naturally have occurred.

Should it be necessary for the patient to take such a journey, she should remain throughout it in a recumbent position. The patient should, moreover, be cautioned that if she is at any time conscious of pain in the back she must lie down at once and remain quiet for at least one hour after the pain has disappeared, no matter how slight it may have been.

Threatened Miscarriage. The occurrence of uterine pain and hemorrhage, together or separately, always indicates some risk of miscarriage. The appearance of both together, if slight, is no more than severely threatening. If both are present to a moderate degree, the case should be treated in the hope of arresting the threatened miscarriage. If both pain and hemorrhage are severe, if the hemorrhage is excessive, or if, with moderate pain and hemorrhage, the cervix becomes dilated to an extent which admits the finger, there is usually little hope of arresting the process.

The treatment of threatened miscarriage consists of the employment of absolute muscular rest and the free use of opium.

By rest in this connection we mean complete quietude in bed without rising for any purpose during the continuance of the symptoms and for at least a week after they have completely disappeared. Opium should be pushed until slight narcosis has been established, and the dose should then be decreased tentatively, to be resumed if the decrease is followed by a reappearance of the pains or hemorrhage.

The danger of the formation of the opium habit must be borne in mind in this as on all other instances of the continued use of opium. The effect of opium in controlling hemorrhage is, of course, indirect, being dependent on its power of arresting the uterine contractions. All mechanical irritation of the cervix must be avoided. The bowels must be kept open, or at least excessive fecal accumulation must be avoided by the use of enemata. The diet should be restricted.

Inevitable Miscarriage. The two dangers which attend miscarriage are exhaustion from hemorrhage and septic infection. Hemorrhage during miscarriage is never so profuse as to be fatal, unless it is allowed to continue until profound exhaustion is present. In other words, it is not the amount of blood lost at any one time which is the source of danger, but the continued loss of a moderate amount of blood.

The hemorrhage depends on the retention in the uterus of some portion of the ovum, and never persists after the contents of the uterus have been thoroughly evacuated.

Septic infection, in like manner, rarely occurs if the uterus is perfectly empty, but the retention of some portion of the ovum is very common after miscarriage, and furnishes an excellent field for bacterial growth. In the few cases in which infection of the uterus does occur in spite of its thorough evacuation, it is due to lack of proper surgical cleanliness in the removal of uterine contents. Since both the dangers of miscarriage are increased by a long continuance of the process, it becomes evident that as soon as the increase in the symptoms convince the attendant that miscarriage is inevitable, all expectant treatment should be abandoned, and his efforts should be directed toward hastening the completion of the process.

The measures which should be adopted divide themselves into two groups: those which are intended to hasten expulsion by natural means, and those which are directed to an operative removal of the ovum.

The first class consists in the use of ergot and of the vaginal tampon. The second comprises the removal of the ovum by the finger or by the curette. The choice between the two classes of treatment depends mainly upon the condition of the ovum—*i. e.*, if the ovum is intact the methods of the first class should be employed, while if the fœtal membranes are ruptured the method of the second class should be used. The expulsion of an intact ovum is much the more favorable event, since in these cases hemorrhage is rarely severe, because the effusion of blood behind the ovum forces it down against the internal os, where it acts as a ball valve, preventing any further loss of blood after the uterine cavity has been filled, while the contractions of the uterus against the contained mass of blood and ovum tend to dilate the cervix as in natural labor.

When rupture of the membranes occurs the efficiency of the ovum as a valve is lost, and the effused blood escapes between the fœtus and cervix and may continue until the continued though moderate loss of blood has seriously weakened the patient.

One exception to this rule must be noted, however. In those cases in which the decidua are so completely detached from the uterine walls as to permit the descent of the whole remaining portion of the ovum into the cervix, this may be large enough to prevent the escape of the effused blood and permit the occurrence of spontaneous delivery —a state of affairs which is to be surmised from the non-appearance of hemorrhage and the persistence of pains after the escape of the fœtus.

TREATMENT. On assuming charge of a case of inevitable miscarriage the physician's first duty is to collect and examine all the clots that have been passed, so far as they can be obtained. As the fœtus is usually enveloped by blood-clot when passed, all clots of any size must be very carefully torn apart under water, before the absence of the fœtus can be assumed. If no portion of the ovum is

found in the clots, or if on vaginal examination the smooth elastic surface of the intact membranes is felt within the cervix, the use of any form of manipulation which could possibly rupture the fœtal sac is to be avoided and the treatment confined to the use of ergot and the tampon.

Ergot: Before Rupture. During the first three months of pregnancy ergot has an effect closely similar to that which it exerts on the non-pregnant uterus, and in moderate, repeated doses promotes expulsion; but after this period its action is less reliable on account of its tendency to produce a tonic contraction of the more developed cervix.

Tampon. The tampon, if properly applied, is the best and most efficient means at our command for the treatment of those cases of miscarriage in which the ovum completely fills the cervix. The application of a small tampon through the cylindrical or bivalve speculum, with the patient in the dorsal position, is totally inefficient. To secure the best results the patient must be placed in the left latero-prone position and the perineum retracted by a Sims speculum. The vagina should then be thoroughly swabbed out under the guidance of the eye with a 1 to 5000 corrosive or a 1 to 100 lysol solution, care being taken that the whole surface of the vagina and cervix be thoroughly cleansed. A number of small plugs of cotton or strips of gauze should be wrung out in the same solution, and packed around the cervix, one after another, until the fornix of the vagina is thoroughly distended.

The speculum should then be slightly withdrawn and the lower part of the vagina packed in the same way, the object being to obtain the greatest distention of the vagina possible without causing marked discomfort or pain. The tampon should be removed by the physician at the end of twelve to twenty-four hours, piece by piece, under the guidance of the eye, and with the patient preferably in Sims' position as before. In many cases the ovum and clots will be found already within the vagina, behind the tampon.

If this has not occurred, and the patient's condition is such that there are no indications for hurry, the process can be repeated until the desired object is obtained or until she begins to show signs of exhaustion, which call for more radical measures.

The action of the tampon may with advantage be reinforced by the administration of ergot if the pains are weak.

After Rupture. After rupture of the ovum it is proper to administer ergot, introduce a tampon and wait a few hours in the hope that spontaneous expulsion may still occur, provided that the hemorrhage is not excessive. If at the end of that time no progress has been made, or if the hemorrhage is still going on, the physician should not wait for the appearance of exhaustion, but should proceed at once to the immediate removal of the remains of the ovum. This

may be done with the finger, or by a curettage, and it may be laid down as a general rule here, as elsewhere in obstetrics, that the sentient finger is the best instrument when it can be used. In these cases, however, the choice of instrument depends upon the amount of dilatation present. If the cervix is so far patulous that the finger can be passed into the uterine cavity without undue force, the finger is by far the better instrument, but if the cervix is too small to admit the finger the curette must be employed instead.

Removal by the Finger. If the patient is not extremely sensitive, and rough and abrupt movements are avoided, it is usually possible, with the patient in the lithotomy position, to depress the uterus by pressure through the abdominal walls to such an extent that the index finger of the other hand can be passed through the os and up to the fundus without the use of anæsthesia. If this is successfully accomplished the tip of the finger should be made to pass up one lateral wall of the uterus to the fundus until it is entirely above the ovum. It should then be passed gently across the fundus to the opening of the other Fallopian tube and swept downward along the corresponding lateral wall, driving the clots and retained membranes into the vagina in the process. If during this manipulation the decidua escape from under the finger and slip back to the fundus, the finger must be again passed above them before the removal is attempted.

After the uterus has been emptied as completely as possible by this method, it is well, though not absolutely necessary, to curette the whole uterine cavity gently, and it is surprising to see at times the amount of detritus which is removed from an apparently empty uterus.

Removal by the Curette. The use of the finger is less difficult to the inexperienced than the use of the curette, but in cases where the cervix is not sufficiently dilated to make the introduction of the finger easy, the use of the curette is preferable. It may be used through the bivalve speculum with the patient in the dorsal position, but an operator who is familiar with the use of the Sims speculum will usually prefer the semi-prone position on account of the greater freedom of motion which it permits to the curette. The patient being in position, the vagina should be thoroughly cleaned and a medium-sized curette should be passed gently through the cervix, and all portions of the uterine wall thoroughly scraped, the complete removal of the decidua being recognized by the grating sensation which firm uterine tissue gives to the hand during the use of the curette.

After the uterine cavity has been thoroughly emptied it should be flushed with a solution of corrosive sublimate, 1 to 5000, followed by boiled water at a temperature of from 100° F. to 110° F. These, like all other intra-uterine injections, should be given under the guidance of the eye. A double current intra-uterine catheter may be used, but this is not necessary if a careful watch is maintained to see

that the return current is free around the douche tube, but any neglect of this precaution may result in forcing part of the injection into or through the Fallopian tube, and in thus setting up a salpingitis or pelvic peritonitis.

Fibrinous Mole. Any small portion of the decidua which may be left within the uterus usually disintegrates and causes no trouble, provided full antiseptic precautions have been observed. It occasionally happens, however, that the retained fragments receive sufficient nourishment to remain alive and then develop into a polypus-like mass, which is known as a fibrinous mole.

The formation of such a growth gives rise to fresh or increased hemorrhage, which may at times be severe. The treatment consists in its removal by the finger or by the curette as above described. The hemorrhage during removal may be so severe as to be alarming, but usually stops spontaneously if the site from which the mole has been removed is thoroughly curetted. If it continues after this has been done the uterus should be firmly packed with sterile gauze, which is always efficient in controlling it.

Neglected Miscarriage. When a miscarriage has been allowed to proceed without treatment until the patient is greatly exhausted by hemorrhage, or until septic infection of the uterus has occurred, it was formerly the custom to counsel delay until efforts to improve the patient's general condition had been successful.

This is poor treatment, however, as little improvement can be expected in the patient's condition until the cause of the trouble has been removed.

The modern view is that the thorough emptying of the uterus by the gentle use of the curette under full antiseptic precautions followed by the administration of a careful intra-uterine douche is the best treatment.

It is injudicious to resort to stimulating measures in the treatment of collapse from hemorrhage until the cause of the hemorrhage has been removed, as it is rarely possible to prevent still further loss of blood until the uterus is completely empty. In the same way the source of a septic absorption must be removed before we can expect to stop the absorption. If in such cases a temporary improvement is followed by recurrence of the trouble, the operation should be repeated promptly.

The only exception to this rule is in those cases where the gentle use of the curette shows that general involvement of the uterine tissue by the infection has occurred, and that the uterus is softened and is becoming disintegrated, when constitutional treatment offers the only chance for the patient.

Lochia of Miscarriage. A slight lochial discharge usually persists after a miscarriage for about three times as many days as the gestation has lasted months.

AFTER-TREATMENT. The after-care of a case of miscrriaage varies in individual cases with the condition of the patient, being dependent largely on the amount of exhaustion which has followed hemorrhage or infection.

Rest in bed for from a week to ten days, or longer, as the condition of the patient demands, is to be advised, and the use of such other measures as are indicated in the individual case.

Miscarriage After the Third Month. The management of miscarriage after the third month differs but little from that of the earlier months, except in the following particulars. After the formation of the placenta the expulsion of an intact ovum is comparatively rare. The birth of the fœtus differs from delivery at term only in the fact that the dilatation of the cervix is apt to be very slow and tedious. This may be sufficient to result in an undue prolongation, or even in an arrest of labor, and a manual dilatation may become necessary.

In breech presentations, which are very common in miscarriage, the after-coming head is usually arrested by the contraction of the os around the neck of the fœtus, which must then be delivered by steady but gentle traction upon the lower extremities. The greatest care must be exercised in these cases to avoid lacerations of the cervix.

In the great majority of cases the placenta is retained and requires manual removal, and except during the fourth month the use of the finger is preferable to that of the curette for the reasons already given, and is usually easy because in the great majority of cases the os is freely patent.

Premature Labor.

Premature labor differs in no way from labor at term, and should only be expedited in the presence of any of the ordinary obstetrical indications, though the weakness of the child demands that special attention be paid to its interests.

Hydramnion.

The condition known as hydramnion is essentially the presence of an abnormal amount of liquor amnii. The cause of this increased amount of amniotic fluid is not definitely known. Syphilis has been supposed to play an important part in the etiology, and there is no doubt that a large number of the cases are syphilitic. On the other hand, in many cases no evidence of syphilitic infection can be found, and no explanation has been generally accepted as yet for these cases. It is not known whether hydramnion is maternal or fœtal in origin, but the fact that fœtal monstrosity is frequently coexistent with hydramnion must be noted as evidence of its fœtal origin.

The discomfort due to the condition must be endured until the mother's life is actually threatened by embarrassment or partial arrest of circulation or respiration; it may then be treated by puncture of the membranes. The effects of hydramnion on labor, with the dangers it involves, will be described in a later chapter and need not be considered further in this connection.

Malpositions and Abnormalities of the Pregnant Uterus.

Prolapse. Prolapse of the uterus rarely appears for the first time during gestation, but in the majority of cases is the result of injuries to the pelvic floor received during a previous labor. Uncomplicated prolapse of the uterus offers no obstacle to conception, however, and minor degrees of this condition are not infrequently associated with pregnancy. As the uterus gradually increases in size, one of two possible results occurs. The pelvic space becomes insufficient to contain the growing uterus about the end of the third month, and the uterus in the majority of cases ascends into the abdomen, thus spontaneously curing the prolapse. Owing to the increased congestion of the uterus, which is a natural accompaniment of prolapse, there is a marked tendency to miscarriage, so that in many cases pregnancy is terminated before the uterus has reached the size when the malposition is spontaneously relieved.

It is important, therefore, to replace the uterus and retain it in normal position by the adjustment of a suitable pessary in every case in which any considerable degree of prolapse is found during the early months of gestation, because the irritation caused by the presence of a suitable pessary is much less liable to result in miscarriage than is the persistence of a prolapse which has already caused sufficient discomfort to cause the patient to seek advice.

It is of even more importance in these than in ordinary cases to prevent irritation of the vagina by the pessary. For this reason it is important that the patient should be examined at intervals of from two to three weeks. At each visit the physician should make a careful determination of the relations between the pessary and the vaginal walls and uterus, in order to alter its shape and size from time to time, as may be rendered necessary by the increased size of the uterus. The use of too large a pessary cannot be too carefully avoided, as any ulceration of the vaginal walls or even undue pressure upon the fundus may readily result in miscarriage.

Incarceration. In cases of prolapse of the second degree, where treatment has been neglected, and miscarriage has not occurred, incarceration of the gravid uterus within the pelvic cavity may result. This accident not only exposes the patient to the risks of certain miscarriage, but also involves some danger of sloughing and gangrene of the pelvic contents from the pressure due to the increased size of

the uterus. If this rare condition is found, immediate abortion is indicated, provided that all attempts at replacement of the uterus are unsuccessful. Attempts at replacement, to be efficient, should be conducted with the patient in the knee-chest position. The half or whole hand should be introduced into the vagina, and persistent attempts made to replace the uterus, under anæsthesia if necessary.

Anteversion. In the early months of pregnancy the normal anteversion and flexion of the uterus become somewhat exaggerated, but seldom to a degree sufficient to produce symptoms aside from dysuria and frequent micturition, which are dependent on the traction on the neck of the bladder caused by the pressure of the heavy uterus. This may be relieved in the majority of cases by directing the patient to pass as much time as possible lying flat on her back, and her mental condition may be relieved by the assurance that the discomfort is only temporary.

In women of lax muscular development, and in those on whom abdominal section has been performed, the uterus may receive insufficient support from the anterior abdominal wall, and fall forward, resulting in what is generally known as a pendulous abdomen. This falling forward of the uterus is found generally in multiparæ, especially in those who have borne children in rapid succession. The symptoms associated with pendulous abdomen may become very marked, and labor may be interfered with. The application of a suitable abdominal binder is indicated for the rectification of the malposition.

Retroversion and Retroflexion. Backward displacements are not only by far the most common malpositions of the pregnant uterus, but they are also the most troublesome. They give rise to many reflex disorders, as for example, the extreme degrees of nausea and vomiting, and, moreover, they expose the patient to some risk of incarceration of the uterus. (Plate III.)

When either of these displacements is due to the existence of firm adhesions between the fundus and the posterior wall of the pelvis, miscarriage is the almost inevitable result. When they are uncomplicated by such adhesions, treatment during the early months is easy and effects prompt relief. The uterus should be replaced as soon as the diagnosis is made, and should be retained in position by a suitable pessary.

Incarceration. If retroversion of the pregnant uterus be allowed to persist untreated, the natural increase in the size of the organ may result in spontaneous reduction of the displacement, but the more common result is the incarceration of the enlarged fundus beneath the promontory of the sacrum. This accident as time goes on leads to a progressive increase of the displacement, until in extreme cases the fundus has been found to have depressed the posterior vaginal wall nearly to the perineum, while the cervix points almost directly upward.

The amount of sacral pain and vesical distress which the traction of such extreme displacements causes can readily be imagined.

PLATE III.

Retroverted Pregnant Womb; Distended Bladder. Red line show
altered relation of Peritoneum. (Schwyzer.)

Rupture of the bladder has been reported in a few cases as the result of the traction of the uterus upon the bladder.

TREATMENT. In simple cases it is sometimes possible to effect reposition of the uterus with two or more fingers of the examining hand, with the patient in the lithotomy position. If this attempt fails, as will usually be the case, the patient must be placed in the left lateroprone, or better in the knee-chest position. In this position, if all pressure of the clothing is removed from the abdomen, retraction of the perineum, with the consequent entrance of air into the vagina, may effect replacement by the influence of gravity alone.

To aid in obtaining this result the patient should be instructed to make a number of forced respirations, while the physician retracts the perineum with the speculum and watches the motions of the cervix. This failing, two fingers of the left hand should be introduced into the rectum, and should make pressure upward and forward upon the fundus of the uterus, while the forefinger of the other hand is introduced into the vagina, and attempts made to hook the cervix down, or the cervix may be grasped with bullet forceps and direct traction made on it.

The fundus should be allowed to pass to that side of the sacral promontory to which it seems naturally to incline, as it is seldom possible to press it forward in the median line.

It is very common for incarceration, even when unaccompanied by adhesions, to be accompanied by extreme œdema and congestion. In these cases reposition of the uterus should be preceded by an attempt to relieve the swelling by a course of depletive treatment.

The best means to this end consists in the persistent use for many days, if necessary, of a glycerin tampon in the vagina. This tampon should be small, should be soaked in a mixture of equal parts of glycerin and water, and must be renewed at least twice in twenty-four hours. It should be kept continuously in position. The patient must be kept in bed to reduce the pelvic congestion to a minimum, and the bowels should be kept freely open by the use of saline cathartics.

After the reduction of the swelling, or if after several days' use of the tampon, no effect is perceptible, a prolonged and persistent attempt at reduction should be made under ether by the method already described.

If the case is complicated by the presence of firm adhesions, or if in uncomplicated cases persistent efforts by the foregoing methods fail to reduce the incarceration, it may be regarded as certain that the situation is such that, in view of the serious dangers consequent on the malposition, radical measures must be resorted to.

An attempt should now be made to replace the uterus in its proper position by the use of a systematic tamponade of the vagina, introduced through a Sims' speculum in the manner described in all text-

books on gynecology for the relief of retroversion. This procedure will frequently be followed by miscarriage, but may occasionally result in replacement of the uterus without disturbing the pregnancy. On account of the probability of its resulting in miscarriage it should never be resorted to without due consultation with another physician, and then only after full explanation of the circumstances of the case to the patient's family. In case of failure by this method, if the patient's general condition is good, the treatment which offers the best chance is the performance of a laparotomy, a thorough separation of the adhesions, and the replacement of the uterus in its normal position. If laparotomy is contraindicated and the packing is without effect, the induction of labor is indicated, but owing to the displacement of the cervix this may be of considerable difficulty. If the os can be reached by the finger, digital dilatation and rupture of the membranes is the most effective and easiest method of treatment, but if the position of the cervix makes this impossible, the object may be sometimes attained by the use of the following mechanical device: The end of a small metal catheter should be cut off and the last inch of the remainder bent sharply on itself. The instrument may then be passed along the anterior surface of the cervix, under the guidance of the finger, until its end can be hooked into the uplooking external os.

If this position has been once attained, a flexible strip of whalebone or a soft probe may be passed through the catheter, and, following its curves, may be made to enter the uterine cavity and rupture the membranes. In case of failure of all other means, aspiration of the liquor amnii through the vaginal walls may be attempted under the strictest asepsis.

Cases of this desperate nature are daily becoming more rare, and can only follow neglect of the earlier stages of this condition.

Abnormalities of the Sexual Organs.

The uterus and vagina are in early fœtal life represented by "Müller's ducts," which at this stage of development are double and bilaterally symmetrical. As the fœtus develops these ducts coalesce, the median septum disappears from below upward, and a single uterus and vagina are formed.

Arrest in their development during the early part of fœtal life may result in the persistence of the median septum in any portion of the uterus or even throughout the whole parturient canal.

Thus we may find a double uterus with a single cervix, or even a complete duplication of the uterus and cervix, and either of these deformities may exist with a single or double vagina.

Since, however, the disappearance of the median septum takes place from below upward, the existence of a double vagina is absolute

proof of the presence of a double uterus and cervix, and a double cervix presupposes a double uterus. (Figs. 39 and 40.)

Some of these malformations are of practical importance at the time of labor, since they may offer an efficient obstacle to delivery, but as they are rarely discovered during pregnancy, and are of no importance during that period, no further description is necessary here.

FIG. 39.

Double vagina and uterus. (LEISHMAN.)

FIG. 40.

Bifid uterus. (PLAYFAIR.)

Hernia. Hernia of the uterus is very rare under any circumstances, and hernia of the gravid uterus occurs even more rarely. The existence of this condition is always a sufficient indication for the immediate induction of labor, unless the displacement can be easily reduced by taxis under anæsthesia.

Surgical Operations.

Unnecessary surgical operations are to be avoided during pregnancy, because the risk is always present that they may be followed by miscarriage. Minor operations on tissues which have no connection with the reproductive system may be performed if sufficient indications exist with comparative safety, and are rarely attended by unpleasant consequences.

Operations upon the genital tract, upon the breasts, and around the rectum, are frequently followed by miscarriage, even though the operation may be a slight one. Such operations should, therefore, never be performed unless the indications are imperative—*i. e.*, to save the life of the mother, which may be seriously threatened if the operation is deferred, or because the presence of some new-growth or other pathological condition offers an insuperable obstacle to delivery.

Cancer of the Cervix. Cancer of the cervix may develop after the beginning of pregnancy, or pregnancy may occur in a uterus which is already the seat of a malignant growth. In both classes of cases

the growth is liable to increase very rapidly and involve the surrounding tissues with startling rapidity. The symptoms are those of cancer in non-pregnant cases—*i. e.*, intermittent hemorrhages, a foul discharge, and the presence of a fungus-like growth involving the cervix.

With regard to treatment the cases may be divided into three classes with reference to the possibility of saving one or both patients. In the first class may be placed those cases in which the new-growth is discovered early in its development, before the process has involved the surrounding structures, and in which pregnancy is not far advanced. The indication in these cases is for immediate hysterectomy, since a spontaneous miscarriage is probable as the process invades the uterus, and by early operation we can probably ensure the mother against a return of the disease at the expense of a problematical sacrifice of the fœtus.

In the second class of cases belong those in which the possibility of preserving the lives of both patients exists—*i. e.*, those in which the fœtus has nearly reached the period of viability, and in which the malignant process has not yet involved the surrounding structures. In these cases it is our duty to defer operation until the fœtus is viable, if possible, and then to deliver the fœtus and remove the uterus at the same time, with the hope that both patients may be saved. The third class of cases comprises those in which the malignant process has so far advanced that no hope of saving the mother by a radical operation exists, and our duty is to the child only.

As soon as the period of viability is reached as much of the malignant growth as possible should be removed by the sharp curette, or by amputation of the cervix, to lessen the risk to the mother of fatal hemorrhage, which is apt to follow delivery in these cases. This operation should be followed by the free use of opium in the hope of preventing premature labor until the tissues have healed.

Ovarian Cysts. The mere presence of an ovarian cyst does not call for active treatment during pregnancy. The size, location, and rapidity of growth must all be considered. For instance, a small ovarian cyst which is retained in the pelvis by adhesions may form a serious obstacle to delivery, or jeopardize the patient's life by sloughing after labor, from the pressure sustained during labor. On the other hand, a large ovarian cyst which can be raised by taxis out of the pelvis and into the abdominal cavity demands no interference unless its growth is so rapid that it threatens to cause abortion by the pressure it exerts on the uterus. As a general rule, then, it may be stated that an ovarian tumor which cannot be raised out of the pelvic cavity should be removed by cœliotomy as soon as practicable after its discovery, whereas a tumor which can be raised into the abdominal cavity should not be interfered with until after delivery, unless some definite indication arises. When a laparotomy is necessary the free use of opium after operation may often prevent a miscarriage.

Trauma. The results of accidents bear about the same relation to pregnancy as do those of surgical operations. The chance of miscarriage after accident is proportional to the severity of the injury received in the first place, and in the second to the proximity of the seat of accident to the pregnant uterus.

In the after-treatment of accidents to and operations on pregnant women, absolute rest in the recumbent position and the free use of opiates are the most important factors. Both accidents and operations are less well borne at about the times corresponding to the menstrual periods than at any other time, and are especially liable to provoke miscarriage at the third and seventh months. On account of the liability to miscarriage a surgical operation should always be deferred until after the period of viability has been reached if possible.

Endometritis. Among the pathological conditions of the uterus not uncommonly observed and often resulting in the interruption of pregnancy, endometritis is the most common. It is almost invariably infectious in its origin.

The symptoms of this condition during pregnancy are intermittent metrorrhagic and mucoid, watery discharges. Undue sensitiveness to the fœtal movements is claimed by some writers to be a sign of this condition. One of the results of this affection is the adherence of the membranes about the internal os, rendering dilatation of the cervix slow and tedious, and premature rupture of the membranes probable.

Adherence of the placenta is a usual consequence of endometritis during pregnancy, and the dangers of this complication must be expected when endometritis is present.

In women who have had several unexplained miscarriages in rapid succession, endometritis is often present, even though the cause cannot be recognized.

The catarrhal form of endometritis is supposed to be the cause of the affection known as hydrorrhœa gravidarum.

The existence of this disease is signalized by the discharge at intervals during the middle or later months of pregnancy of a thin albuminous fluid, varying in quantity from a drachm to several ounces, unaccompanied by pain, and never followed by miscarriage.

The treatment of endometritis complicating pregnancy consists in attention to the general health of the mother, with careful observation of the quantity and quality of any discharge from the uterus.

When a watery or a bloody discharge is constant and has persisted for some weeks, it is highly probable that the life of the ovum has already been sacrificed. If the patient is not in circumstances where she can have good care and be under faithful observation, it is better to terminate the pregnancy as soon as possible.

Salpingitis. Chronic unilateral salpingitis is a not infrequent complication of pregnancy. This condition is, of course, usually asso-

ciated with pelvic peritonitis and adhesions of the pelvic viscera, and sometimes gives rise to prolonged anorexia and hyperemesis. The patient's usual complaint is that of pain, tearing or cutting in character, due to the stretching of the adhesions caused by the increase in size of the uterus. The pain is not constant, but comes at irregular intervals. The uterus is often found in an abnormal position and abnormally fixed. A tumor may or may not be detected at one side of the uterus. Close questioning of the patient will usually reveal a history of previous infection, usually gonorrhœal in character.

The prognosis of salpingitis during pregnancy depends mainly upon the extent and firmness of the adhesions. If these are dense enough to fix the uterus firmly the chances of the pregnancy going on to term are poor. The first duty of the obstetrician is to the mother, and as soon as the diagnosis is established an attempt should be made to stretch the adhesions gradually and raise the uterus, in combination with rest in bed. If this fails and the patient's condition demands it, the possibility of affording relief by a laparotomy should be considered.

Pyosalpinx complicating pregnancy may prove a source of positive danger to the patient through threatened rupture and septic infection. As has been already said, miscarriage is very likely to occur, and, therefore, there should be no hesitation in resorting to radical measures should the conditions become serious. It is possible to open the abdomen and remove a diseased tube and ovary without interrupting pregnancy. The special danger of this complication arises during and after labor, and this indicates the great reason for radical measures during pregnancy. A tubal abscess may be ruptured into the general peritoneal cavity with fatal results during labor, and cases have been reported in which the rupture of a small abscess during the convalescence has proved fatal after the patient had passed through pregnancy and labor apparently without complication.

Diseases of the Ovum.

Death of the Fœtus. Death of the fœtus may result from any general disease of sufficient severity. When it results from an acute illness miscarriage usually ensues promptly, but when the death is due to a chronic affection, the fœtus may be retained in utero for an indefinite period, and may even be carried to full term. It is sometimes important to diagnose the occurrence of fœtal death, but unfortunately the symptoms which point to it are seldom marked.

Pregnant women are frequently alarmed by the disappearance of the fœtal movements. This is due in most cases to some change in the position of the child which makes them imperceptible to the mother for a period of a few hours or days. This, by itself, is of no importance, but in connection with the other symptoms has some

significance. Cessation of movement due to the death of the fœtus is often preceded by an increase in movement which is probably of convulsive origin. Death of the child is sometimes followed by swelling and turgescence of the breasts, with or without the appearance of milk in them. This is followed by a marked decrease in their size, and they become flabby and soft. Malaise, fatigue, and general lassitude may be present. A sensation of weight and coldness in the abdomen may also be complained of. If the fœtal heart sounds have been previously heard, their continued absence is suggestive, but it must be remembered that they, like the fœtal movements, are liable under normal conditions to disappear for short intervals. A return of the nausea and vomiting after these have once disappeared is significant in connection with the other signs.

When an embryo of not more than two months dies, it may be wholly absorbed, the membranes remaining and forming what is known as a blighted ovum. After two months absorption is rare, and maceration is the rule. Maceration is an aseptic decomposition, and the macerated tissues rapidly become so soft and flabby that the fœtus when laid on a level surface assumes a flattened form under the influence of gravity, like a bag partly filled with fluid. The epidermis becomes loosened and peels off at the slightest touch. The fœtus emits a stale, sickly, sweet odor, easily distinguishable from that of putrefaction. The presence in utero of a macerated fœtus never causes septic absorption. If, however, air be admitted to the uterus, and the germs of decomposition come into contact with the membranes, true putrefaction rapidly ensues, and absorption of septic poison by the mother is by no means unlikely to occur.

PART II.

NATURAL LABOR.

CHAPTER IX.

CLASSIFICATION OF LABOR. DIAGNOSIS OF PRESENTATION AND POSITION.

CLASSIFICATION OF LABOR.

For purposes of description labor cases are classified under the head of presentations. By the term presentation we mean the relation which the long axis of the child bears to that of the uterus, whether parallel to it or not; and, further, in longitudinal presentations, whether the cephalic or pelvic end of the child presents at the inlet of the pelvis.

Head presentations are subdivided into those of the vertex, brow, and face, according to the part of the head which occupies the pelvic inlet.

Pelvic presentations are divided into breech and footling presentations.

Transverse presentations are divided into presentations of the trunk or shoulder.

Shoulder presentations are again subdivided into presentations of the shoulder proper, or of the elbow or hand.

Labor is also divided in two other ways according to the results which may be expected from the presentation, into normal and abnormal, natural and unnatural labor.

Normal labor includes presentations of the vertex only, all other presentations being considered abnormal. This is due to the fact that not only is the prognosis more favorable in vertex than in other presentations, but also because an overwhelming majority of cases are vertex presentations.

Those labors in which delivery is effected by the natural expulsive efforts of the uterus are classed as natural labors, while those in which delivery is effected by obstetric art are unnatural labors.

Each presentation is subdivided into four groups, known as positions, which take their names from the relation which some deter-

minate point on the presenting part of the fœtus bears to the pelvic walls.

Thus the positions in vertex presentations derive their name from the position of the occiput in relation to the pelvis—*e. g.*, occiput left anterior (O. L. A.), when the centre of the occipital bone is in the left anterior quadrant of the pelvic canal. In brow presentations the forehead—*i. e.*, the root of the nose is taken as the determinate point, brow left anterior, etc. In face presentations the positions take their name from the position of the chin (mentum)—*e. g.*, mentum right posterior (M. D. P.), etc. Presentations of the pelvic extremity take their name from the position of the sacrum (S. D. A.), etc., and transverse presentations from the position of the scapula (Sc. D. A.), etc.

The importance of the careful study of positions is much too generally underrated, but it may be accepted as an axiom that no man is capable of doing accurate and intelligent obstetrics who is not in the habit of making the diagnosis of position as early as possible in all cases which come under his care.

Owing to the encroachment of the promontory of the sacrum on the antero-posterior diameter of the inlet of the pelvis, the presenting part cannot enter the pelvis with its long diameter parallel to the conjugate diameter of the pelvis. It would seem on first sight as if the long diameter of the presenting part should correspond with equal frequency with either of the oblique pelvic diameters. The fact is, however, that in the great majority of cases, whether the presentation be vertex, face, or breech, the long diameter of the presenting part occupies that oblique diameter of the pelvis which extends from the left acetabulum to the right iliac synchondrosis.

This is probably due to the fact that the other oblique diameter of the pelvis is encroached on by the rectum, which during pregnancy is apt to be distended with a mass of accumulated feces.

In order to gain a definite idea of the frequency of the various presentations and positions a glance at the following figures based on 3000 consecutive cases taken from the records of the Boston Lying-in Hospital will prove of considerable interest.

Of the 3000 cases 2878, or 96 per cent., were vertex presentations. Of the remainder, 96, or practically 3 per cent., were either breech or footling presentations, while the remaining 1 per cent. was about equally divided between presentations of the face, brow, and shoulder.

Of the vertex presentations practically 70 per cent. were in the left anterior position, and about 28 per cent. were in the O. D. P. position. The remaining cases, in all about 1½ per cent. of the whole number, were divided about equally between the O. L. P. and O. D. A. positions.

These statistics agree in the main with those of other observers.

In face presentations the vast majority of cases occupy either the M. L. A. or M. D. P. positions.

In pelvic presentations the long diameter of the presenting part is at right angles to that which terminates in the sacrum from which the positions are named, and in consequence the common positions are S. D. A. and S. L. P.

Transverse presentations are divided into four positions, according to the anterior or posterior situation of the child's back and to the location of the head on the right or left side of the mother's abdomen. In order to conform to the nomenclature of the other presentations the scapula has been selected as the determinate point from which the positions are named. Thus, if the child lies with its back posterior and its head to the mother's left, the position is scapula left posterior (Sc. L. P.). As will be seen under the head of management of transverse presentations, this division into positions, though arbitrary, is of considerable practical importance.

The study of the action and interaction of the mechanical conditions which govern the passage of the child through the pelvis in a given presentation forms the foundation of all scientific and exact obstetrics, and the possession of skill as an obstetric operator always presupposes an accurate and practical knowledge of the whole subject of mechanism. To ensure a clear understanding of the subject the mechanism of the delivery of each presentation will be considered later under the description of labor in the varying presentations.

DIAGNOSIS OF PRESENTATION AND POSITION.

It is possible in all but a few obscure cases to make a positive diagnosis of both presentation and position by two methods of examination which give evidence of about equal value, namely, the abdominal and vaginal methods.

Abdominal Examination.

From abdominal examination we gain information in three different ways, by inspection, palpation, and auscultation. In the use of this method of examination it is best for the beginner to ignore the possibility of O. D. A. and O. L. P. positions on account of their great infrequency and the complications in diagnosis that the effort to recognize them involves.

The value which the individual obstetrician places upon an abdominal examination is generally proportionate to the experience he has had, and the beginner should avail himself of every opportunity for practising this method. At first he will find many cases in which the thickness or rigidity of the abdominal wall, or the uterine rigidity render abdominal palpation of no value, a large

number in whom the result is inconclusive, and only a few in whom he can make a positive diagnosis by this means. As his experience increases he will find that the cases of the first class will steadily decrease in number, while those of the other two classes will progressively increase, if he is careful to palpate thoroughly every case which comes under his charge.

The value which attaches to the facility of making diagnosis by this means in many difficult operative cases can only be appreciated by those who possess it. It is a fact that to the experienced hand abdominal palpation yields results fully as valuable as those which can be obtained by vaginal examination, and there are very few cases in which repeated examinations during the progress of labor fail to establish the diagnosis by palpation and auscultation alone.

Inspection.

Inspection is the least important of the methods of abdominal examination, but not only can we gain valuable evidence as to the existence of transverse presentations and of multiple pregnancy, but in the majority of cases we learn in longitudinal presentations whether the child is lying in the right or the left position.

The abdomen should be uncovered and thoroughly examined, with the patient lying squarely on the back. In transverse presentations the increased breadth of the uterus as compared with its length may give valuable evidence.

In cases of multiple pregnancy the increased size of the uterus is usually all that can be detected by inspection, but we may sometimes find a shallow S-shaped sulcus running obliquely across the abdomen, which marks the separation of the amniotic sacs, *i. e.*, the portion of the uterus which is least distended by its contents.

In the longitudinal presentations the abdomen may seem to be absolutely symmetrical, in which case we gain no evidence of value, but in most cases the two sides of the abdomen differ markedly from each other. In the majority of cases that side of the abdomen toward which the back of the child lies is slightly higher than the other side, and apparently narrowed, rising abruptly and sloping off gradually into a long low bulge on the other side of the median line. In other words, the portion of the uterus containing the larger part of the child appears to the eye as if more distended than the rest of the uterus.

The presence of a large amount of liquor of course distends the uterus equally throughout, and inspection becomes of no value in those cases.

Palpation.

Palpation is the most important part of the abdominal examination. It should be performed only in the intervals between pains, all press-

ure of the hand being discontinued during the uterine contractions. (Fig. 41.)

The physician should stand by the side of the bed facing the patient's feet, and should apply the palms of the hands flat against the corresponding sides of the uterus. All motions made during the examination should be slow and gentle, as any jerky or rapid impulse

FIG. 41.

Displacing fœtus to one side of abdomen. (JEWETT.)

is liable to result in rigidity of the abdominal walls and uterus, and thus defeat the object of the examination.

Every effort should be made to divert the patient's attention, to soothe her fears, and to assure her that the examination will not be painful, and it not infrequently happens that after a total failure a second attempt may yield satisfactory results, owing to the changed mental condition of the patient.

The finger-tips of each hand should be pressed with gradual and gentle motion downward behind the symphysis pubis in search of the presenting part. If we are dealing with a cephalic presentation, the head will be felt in this region as a transverse bar to the entrance of the hands into the pelvis. The depth at which the presenting part lies in the pelvis should be estimated, and also its mobility, as these

FIG. 42.

Palpation of lower fœtal pole. (JEWETT.)

give us some evidence of the progress which has already been made. Some observers claim to be able to estimate the dilatation of the os by this method of palpation, but in reality they merely estimate the descent of the head, which is apt to be entirely misleading as to the amount of dilatation obtained. In palpating the head in the pelvis it usually happens that one hand feels the head more distinctly than the other. The significance of this only appears fully after the loca-

tion of the back has been made out. If the hand corresponding to the back sinks more deeply into the pelvis than the other hand, we are dealing with a well-flexed head, the sulcus between the shoulders and occiput being practically obliterated by the flexion of the head, so that the occiput offers no resistance to the hand, while the other hand is obstructed in its descent into the pelvis by the prominence of the forehead. (Figs. 46 and 47.)

FIG. 43.

Palpation of upper fœtal pole. (JEWETT.)

If the two hands descend about equally into the pelvis before meeting with resistance, we are dealing with a head which has become partly extended. If, on the other hand, the hand corresponding to the child's back meets with an obstruction at a higher level than the other hand, we recognize the fact that full extension to a face has occurred, with the result that the occiput obstructs the entrance of the hands into the pelvis on one side, whereas the obliteration of the sulcus between the chest and chin of the child by full extension of the head allows free entrance to the pelvis on the other side.

After palpating the pelvis the fundus should be carefully examined as a final means of excluding a breech presentation. The head is to be distinguished from the breech at the fundus by its greater size, by its mobility without moving the body of the child, by its rounded contour as opposed to the tapering form of the smaller breech, and by the easily felt sulcus which marks the neck of the child. (Fig. 43.)

FIG. 44.

Locating anterior shoulder. (JEWETT.)

The best evidence, however, of a breech at the fundus is always the recognition by deep palpation of a head lying behind the symphysis.

The hands should then be placed along the sides of the uterus, and should make gentle but deep pressure toward each other, with the uterus and child directly between their palms, in order to estimate the relative resistance of the two sides, and then definitely ascertain the position of the back, since the firm, flat back presents a markedly

greater resistance to pressure than the yielding abdomen and movable limbs.

By palpation gently but deeply applied in this way it is often possible to map out the whole child with perfect clearness.

The differing resistances having been made out, the fingers should be applied to the sides of the uterus, not with the tips deeply in-

FIG. 45.

Locating cephalic prominence by grasping fœtal head with hand held across the suprapubic region. (JEWETT.)

dented into the abdomen, but with their whole palmar surface pressed firmly against the uterus.

The hands should be then moved gently up and down the uterine wall in the attempt to recognize the irregularities due to the fœtal limbs, but during this search the possibility of mistaking the round ligaments for the fœtal members must be borne in mind.

These ligaments are at term nearly the size of the adult finger, and extend obliquely from the cornua of the uterus downward, outward, and forward to the pelvic brim. They may be recognized by their situation and by the pain the patient always complains of when they are rolled about under the fingers. The existence of small subperitoneal fibroids is another possible source of error. With thin and flaccid abdominal walls it is sometimes possible by this method to recognize the fœtal limbs with the utmost distinctness, but in the majority of cases an irregularity in the contour of the uterus is all that is to be expected.

FIG. 46. FIG. 47.

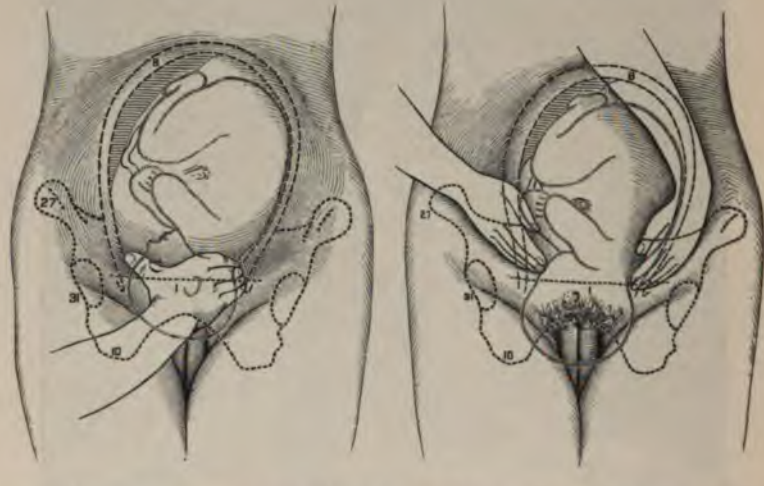


FIG. 46.—Diagram showing relation of hand to fœtal head in manipulation for locating cephalic prominence. (JEWETT.)

FIG. 47.—Diagram showing method of locating cephalic prominence by palpation with both hands. (JEWETT.)

In transverse presentations the diagnosis between the head and breech is always of importance, and is to be made by the signs enumerated above.

In multiple pregnancies the diagnosis is sometimes made possible by the recognition of three large parts (*e. g.*, two heads and a breech), but palpation in a uterus containing more than one child is apt to be unsatisfactory.

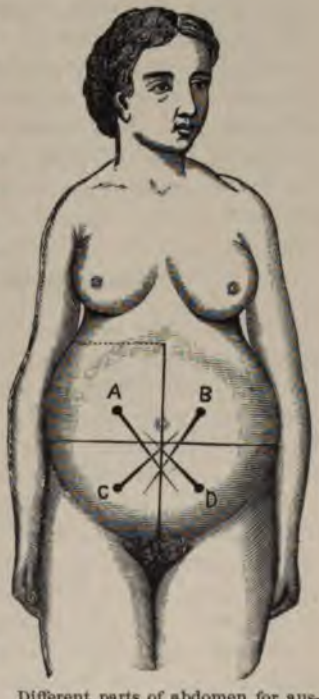
Auscultation.

Auscultation of the fœtal heart gives us confirmatory evidence about the presentation and position of the child, tells us the condition

of the child, and is the most important sign in the recognition of multiple pregnancy.

In interpreting the evidence furnished by this sign in regard to the position of the child, it must be remembered that, owing to the fact that sounds are better conducted by solids than by liquids, the exact location of the fœtal heart sounds corresponds to that portion of the child's chest which happens at the moment to be in contact with the uterine wall. It is evident, therefore, that the situation in which the heart sounds are heard may vary temporarily with the position of the mother as one or the other shoulder of the child comes in contact with the uterine walls, or they even disappear for a time (especially when the patient lies upon her back), owing to the intervention of the liquor amnii between the fœtal chest and the physician's ear.

Fig. 48.



Different parts of abdomen for auscultation. (Parvin.)

Owing to this liability to change, the location of the fœtal heart sounds furnishes merely confirmatory evidence of the position of the child, and is not in itself sufficient ground for making a definite diagnosis. In vertex presentations the heart is ordinarily most plainly heard on the side corresponding to the child's back and below the mother's umbilicus. Thus in O. L. A. positions the most common location for the fœtal heart is in the left lower quadrant of the abdomen. It may, however, exceptionally be heard with equal or even greater clearness in the right lower quadrant above the umbilicus, or rarely over the whole abdomen.

In breech presentations the heart is usually heard over the child's back, but the point of greatest intensity is usually above the umbilicus. In face presentations the location is ordinarily over the ventral surface of the chest. In transverse presentations the heart is usually best heard in anterior positions, but may be plainly heard when the back is posterior. Auscultation furnishes little evidence in these cases as to whether the position is left or right. (Fig. 48.)

The condition of the fœtal heart is the best evidence we have as to the condition of the child, and its importance can hardly be overestimated. If at any time during labor the condition of the child is altered at all seriously for the worse, the change is immediately

shown by some alteration in the rate and regularity of the heart sounds. In this connection it must be remembered that the fœtal heart is increased in rate during a uterine contraction, and that a temporary acceleration of its rate during or immediately after a contraction is of no importance. Any permanent change, however, denotes beginning exhaustion of the child. Steady increase in rate is the first and least significant change which may occur. This may be followed by marked slowing, and this in turn by beginning intermittency, each successive change showing that the child is distinctly losing ground and calling for interference in its interests.

In multiple pregnancy the presence of two distinct fœtal hearts beating at different rates, and neither synchronous with the maternal pulse, gives the only absolute proof of the existence of more than one child in the uterus.

In addition to the fœtal heart sounds the so-called uterine or placental souffle is generally heard as a soft blowing sound synchronous with the mother's pulse. This is probably due to the passage of blood through the uterine arteries and sinuses, and except for the fact that it may obscure the fœtal heart sounds possesses no practical value.

Recapitulation of Signs by Presentations.

Vertex. The head is felt behind the symphysis; the breech is at the fundus; the heart is below the umbilicus, and is usually on that side of the abdomen on which the increased resistance of the back is made out; while the limbs are felt on the other side of the abdomen. If the head is well flexed the prominence of the forehead is felt on the side corresponding to the fœtal limbs.

Face. The head is felt at the brim and the breech at the fundus. The back is found on one side and the heart and the limbs on the other. The limbs are on the side to which the chin is directed, and the occiput, which in face presentations is the most accessible part of the head, is on the side corresponding with the back.

Breech. On deep palpation behind the symphysis the projection of the occiput and face is not found. The head is recognized at the fundus by its size, shape, mobility, and the existence of the cervical sulcus.

The greatest intensity of the fœtal heart is above the umbilicus on the side corresponding to the position of the fœtal sacrum, and the limbs are felt on the other side.

Transverse. Upon inspection the abdomen is found to be unusually broad. The fundus is broad, low, and flat in shape, and on palpation the long diameter of the child is plainly transverse, and a large part is felt in each iliac fossa. Whether the position is left or right is settled by the recognition of the head and breech. In anterior

positions the fœtal limbs are ordinarily not to be felt, but in posterior positions they are usually plainly perceptible. The fœtal heart, while easily obtainable in anterior positions, is apt to be heard with difficulty in posterior positions and is of little value in determining whether the position is left or right. In this presentation the results of abdominal examination are of far more value than anything which can be obtained by vaginal examination.

Multiple Pregnancy. If the uterus contains twins this should be recognized by the abdominal examination. The uterus is much larger than normal, and in a few cases a depression is perceptible at the fundus in the median line. Upon palpation three large parts may be felt, and if one hand be applied to one of the large parts, while the other hand attempts to move the other two, first in one direction and then in another, it is often possible to demonstrate the fact that two of the three are connected, while the third is unaffected or but slightly affected by their motions. It rarely happens that all four large parts are to be perceived, one at least being usually so far posterior as to be out of reach. On auscultation two points of maximum intensity of the fœtal heart sounds may be perceived, the sounds being less distinct in the space between them.

If two observers by simultaneous examination succeed in establishing a difference of rate between the two hearts, and neither corresponds to the maternal pulse, the diagnosis of twin pregnancy is conclusively established.

During labor palpation also furnishes us with extremely valuable evidence as to the condition of the uterus, whether it resumes its normal state of relaxation between the contractions, or is beginning to show fatigue by remaining in a state of rigidity during the intervals.

Vaginal Examination.

In obstetrical work it is best to avail one's self of the extra length of the middle finger by using two fingers in making examinations, except in those cases in which the extremely narrow vulva of a primipara makes the introduction of the second finger painful to the patient. Most American obstetricians prefer to examine the patient when in the left lateral decubitus, but it is well to accustom one's self to examining in all positions, not only in the interests of the patient's comfort, but because it is often possible, by changing the patient's position, to reach a portion of the child which has before been unattainable. The hands should be rendered as nearly surgically clean as possible, whether sterilized gloves are used or not, and, in the absence of sufficient vaginal secretion to thoroughly lubricate the parts, the first two fingers of the examining hand should be anointed with some lubricant which is known to be aseptic, since the introduction of any unsterilized substance into the vagina or uterus

defeats the whole object of all previous care in preparation of the hands for examination.

If the patient is on the left side she should be so covered with sheets that the vulva only is exposed, since it is always best to conduct examinations under the guidance of the eye. The vulva and surrounding parts should be thoroughly cleansed with some antiseptic in order to diminish the risk of contamination, should the examining fingers accidentally come in contact with them while being passed into the vagina. The labia should be separated by the other hand and the examining fingers passed into the vagina in contact with the fourchette and posterior wall, care being taken to avoid any friction against the vestibule and clitoris during the process.

As the examining finger enters into the vagina it should notice the size of the vulvar orifice, the position of the coccyx, the shape of the sacrum, the distance to the promontory, whether it is abnormally easy to reach or not, and the condition of the rectum, whether full or empty.

These points having been ascertained, the fingers should be passed upward into the posterior fornix and swept forward over the soft and yielding vault of the vagina, in the effort to find the os uteri, which is usually situated in the median line near the centre of the pelvis. In case of failure to find it readily, the field of the pelvis should be systematically quartered by the examining fingers. If the cervix is not yet taken up, it is to be recognized as a rounded prominence, on the summit of which is found the orifice of the os, if the patient be a primipara. In multiparæ the lacerated and ragged condition of the cervix frequently makes the external os indistinguishable from an early period of labor, but the finger may in such cases be passed into the cervical canal, and will then recognize the internal os.

If the cervix has been entirely taken up, the os is best recognized by passing the finger through it and into the space between the cervix and presenting part.

The physician's ability to reach the upper portions of the pelvis is more dependent upon the position in which his hand is held than upon the length of his fingers. When it is desirable to reach the upper and posterior parts of the pelvis, the hand should be held in such a position that the perineum may be strongly retracted by the pressure of the web between the second and third fingers.

In order to examine the anterior part of the pelvis the position of the hand should be altered by rotation of the forearm. The space between the second and third fingers is now pressed firmly against the edge of the pubic arch, and the pulp of the finger is directed anteriorly.

When the os has been found the finger should note its size, the thickness of its edge, and whether it is rigid or yielding, and by gentle stretching should endeavor to ascertain the degree of distensi-

bility. In this last manœuvre it is necessary to employ the utmost gentleness in order to avoid the inexcusable accident of manual laceration of the os during examination.

The characteristically different sensations yielded to the finger by the smooth and velvety cervix, the rough but slippery membranes, and the hairy scalp, must be made familiar to every observer. It is easy to recognize these differences if the physician has trained himself to observe them in even a small number of cases, and the possession of this knowledge may preserve him from the dangerous or perhaps fatal error of making an application of the forceps to the intact membranes or over an undilated cervix.

Diagnosis of Presentation. The diagnosis of presentation by vaginal examination, though ordinarily easy, may be very difficult when the presenting part is high in the pelvis. It would be supposed that the distinction between the hard head and the soft and yielding breech could always be easily made, but this is not always the case.

Considerable experience in superintending the work of students has shown that this is a most unsafe and unsatisfactory guide. The only safe rule to adopt is never to make a positive diagnosis of presentation by vaginal examination alone, unless it is possible to recognize at least one suture if a head presentation be suspected, or to insert one finger into the anus and recognize the presence of the coccyx in case of a breech.

When the two fontanelles are the only distinctive points within reach, the vertex presents. If the posterior or small fontanelle alone is within easy reach, the anterior fontanelle being difficult of access, the head is well flexed. If the large fontanelle is as easily reached as the small fontanelle the head has become somewhat extended.

When the supra-orbital ridges and the bridge of the nose are easily accessible and the small fontanelle can only be reached with great difficulty, if at all, the presentation is that of a brow.

The face is to be recognized by the presence of the small and pointed chin, by the insertion of the fingers into the mouth, and by the perception of the nostrils, the eyes, and the root of the nose, and the supra-orbital ridges in their proper positions.

The suboccipital ridges may be mistaken for the supra-orbitals, and result in a mistaken diagnosis unless care is taken to search for the other distinctive features as well.

If the cervix is very thin it may be possible to recognize these diagnostic points through its substance, but in ordinary cases it is necessary to pass the finger through the os in order to distinguish the different parts of the child.

The diagnosis of shoulder presentations is difficult to make by vaginal examination during the early stages of labor, but they should always have been recognized by abdominal palpation before the vaginal examination is made.

At the first examination the presence or absence of the caput succedaneum should always be noted, and the strength and character of the uterine contractions should be estimated by observing the tension to which the membranes are subjected during the height of the pains and by observation of the comparative length of the pains and intervals.

Diagnosis of Position. VERTEX WELL FLEXED. With a vertex presentation and a well-flexed head the examining finger, when passed through the os, ordinarily recognizes not far from the centre of the field the convergence of three sutures which forms the posterior fontanelle. The recognition of this is positive evidence of a vertex presentation with good flexion, but affords nothing more than a hint of the position which the head occupies.

The two lambdoidal sutures enclosing the occipital bone, ordinarily meet at more of an obtuse angle than is formed by the junction of the sagittal and lambdoidal sutures. The occipital bone is usually overlapped throughout labor by both of the parietal bones, one of which usually overlaps its fellow. The observance of these two points may furnish to the expert finger evidence of some slight value in determining which of the three bones is the occipital. The position which the fontanelle as a whole occupies in one or the other quadrant of the pelvis gives another hint of the position which is probably present. The facts, however, are in themselves always insufficient to be made the basis of a positive diagnosis. It must not be forgotten that during labor the posterior fontanelle is obliterated by the crowding together of the cranial bones, being converted into a slight depression formed by the meeting of the sutures which may be readily overlooked unless great care is taken.

Each of the three sutures which enter into the formation of the posterior fontanelle ends in a distinguishing feature, and a positive diagnosis can be reached by following one or more of them to their termination. The sagittal suture ends in the lozenge-shaped anterior fontanelle, from which four sutures emerge at right angles and opposite to one another.

Each of the lambdoidals terminates in one of the irregularly-shaped lateral fontanelles which lies in close proximity to the ear on the one hand and the mastoid process on the other. The lateral fontanelles are often poorly defined, and are important only because they are sometimes mistaken for the anterior fontanelles, being formed by the confluence of four sutures which go off at right angles but not opposite each other. The mastoid is not always to be recognized with ease, but when well marked is about the size and shape of an adult canine tooth, and is, of course, always on the occipital side of the ear.

The flap of the ear must always point toward the occiput, unless, as sometimes happens, it is folded forward against the scalp, a fact

which is easily recognized if the finger is passed backward and forward a few times across the ear. Thus if in addition to the recognition of the posterior fontanelles any one of the three sutures has been followed to its termination, a fairly satisfactory diagnosis may be made by vaginal examination alone, and if two of them have been so followed, the diagnosis is assured. It is a good rule that no obstetrician should ever permit himself to apply forceps without having recognized at least two, and preferably three, of these diagnostic points.

THE EXTENDED HEAD. In presentations of the extended head the anterior fontanelle occupies a position in the pelvis which renders it at least as easily accessible as the posterior. In extreme extension the eyebrows and root of the nose come within reach and the posterior fontanelle disappears.

Additional evidence of extension is also furnished by the fact that in these presentations the examining finger in searching for the ear touches most easily the anterior and not the upper edge of the helix, while the ear as a whole is more easily reached than the mastoid process.

The name of the position of course corresponds to the situation of the occiput.

Brow. The position in brow presentations is named according to the position of the forehead.

Face. When a face presentation has once been detected, the recognition of the position is usually easy, owing to the ease with which the situation of the pointed chin, from which the name of the position is taken, is recognized.

BREECH. In breech cases the diagnosis of the position is often a matter of considerable difficulty, as the soft buttocks are often so compressed and moulded under the forces of labor as to form a very confusing mass. The diagnosis should be made by locating the rough sacral spines on one side of the pelvis and the scrotum or vulvar cleft on the other side. The best method of diagnosis is, however, by the introduction of the finger into the rectum of the child. This renders the recognition of the ischial tuberosities and the tip of the coccyx very easy, and since the situation of the coccyx of course corresponds to that of the sacrum from which the position takes its name, an accurate diagnosis can be made with ease.

PRESENTATION OF KNEE OR ELBOW. When uncertainty exists as to whether a knee or elbow is presenting at the superior strait, the diagnosis may be made definitely if the patella can be recognized; but since this is small, and not always easy of recognition, the best method to distinguish these two joints is to follow the course of the limb to its termination in a hand or foot as the case may be.

PRESENTATION OF A HAND OR A FOOT. If the membranes are ruptured and any doubt exists as to whether a foot or a hand is pre-

senting, it may be drawn outside the vulva and recognized by the eye. If, however, this is not possible, the diagnosis may be made by observance of the following points:

The foot is to be distinguished by the presence of the malleoli, the rounded prominence of the heel, and the fact that the great toe is of equal or greater length than the others, is on the same plane with them, and cannot be separated from them, as can the thumb from the fingers.

The hand is to be recognized by the absence of the heel and by the fact that it is in direct continuation with the line of the limb to which it is attached, and not at right angles to it as is the foot. The thumb is shorter than the fingers, and can be separated from them, and opposed to them with ease, and the hand shows a tendency to grasp the examining finger.

The importance of avoiding rupture of the membranes in either breech or transverse cases is so great that it is usually better to trust to the results of external palpation than to make prolonged efforts to identify the presenting extremity.

TRANSVERSE. The shoulder is liable to be mistaken only for a breech, from which it may be distinguished by the presence of but one limb in place of the two which are attached to the pelvis, and by recognition of the smooth ridge of the scapula, as opposed to the rough spines of the sacrum.

The recognition of a shoulder by vaginal examination is very difficult, and the existence of a transverse presentation should be ascertained in practically all cases by external palpation without assistance from vaginal examination.

When the hand is presenting in transverse presentations it is sometimes possible to make the diagnosis of position by observation of the hand alone. To do this it is necessary to first determine which hand presents, by attempting to shake hands with the presenting part, the right hand of the fœtus coming into position to shake hands with the right hand of the physician, and the left hand with the left.

If the presenting hand be then rotated into a position of forced supination, the thumb points to the side on which the fœtal head lies, and the back of the hand is turned toward the back of the child.

In actual practice the position of the child seldom corresponds exactly to any one of the four classical positions, so that this evidence is of comparatively slight value, and is only to be used as confirmatory of the results of palpation.

CHAPTER X.

ASEPSIS AND ANTISEPSIS. PREPARATIONS FOR LABOR AND DELIVERY.

ASEPSIS.

THE value of asepsis in obstetrical as well as in surgical work is to-day so thoroughly recognized that it is unnecessary to dwell at any length upon its importance.

Even at the present time, however, many physicians apparently regard confinement cases, in private practice at least, as exempt from the dangers of infection which exist in any surgical operation and to which any raw surface is exposed. In spite of the obvious fact that the raw interior of the uterus after labor is exactly as liable to infection as the wound made during a surgical operation, many physicians still regard asepsis as an unnecessary luxury in obstetrical work.

That the employment of surgical cleanliness is not a fad can be seen by a brief study of the records of any hospital which cover the period before and after the introduction of aseptic methods.

The cause of this indifferent attitude toward this improvement in obstetrical work is probably either the ignorance or skepticism of the physician who neglects to employ all measures to protect his patient as thoroughly as possible. It is still said by many that aseptic precautions are unnecessary, because Dr. So-and-So in his large practice had never employed ordinary precautions and yet had never seen a case of septic infection. True, he may never have lost a patient from septic infection, but the boast of immunity without due precautions can usually be accepted as a confession of inability to recognize the slighter degrees of infection. For every death from septic infection many mild cases occur, the majority of which wreck the after-health of the victims.

The dirty finger-nail of the obstetrician still furnishes the gynecologist with a large part of his material, and the chronic ill-health of many women is due to the wilful neglect or carelessness of the physician who attended them during their confinement.

Few men who have not been specially trained realize how largely the milder complications of the puerperal state are dependent upon some breech of asepsis, and how uniformly its stringent observance is followed by a rapid and uncomplicated convalescence. Even among those who believe in the great importance of asepsis, there exists, unfortunately, much ignorance of the details of its employment in obstetrics.

Technique. Since the first introduction of the aseptic practice there has been steady progress toward greater and greater simplification of its details, and the best system is that which, while affording complete protection to the patient, is most conveniently applied by the physician.

The slow introduction of asepsis into obstetrics, even after its universal adoption in surgery, is probably due in part to the assumed difficulty of carrying it out in private houses, and in part to the impossibility of completely sterilizing the field of operation—*i. e.*, the vulva, anus, and surrounding parts. The latter difficulty cannot be entirely removed, but with moderate care it is easy to avoid contamination of the vulva from the anal region.

The impossibility of rendering the region of the vulva aseptic in a surgical sense is always a sufficient reason for adding antiseptic to aseptic precautions, and in obstetrics the two terms are often erroneously employed as synonyms, for the limitations of asepsis render the use of antisepsis necessary. Obstetrical asepsis and antisepsis must be divided into the asepsis of the attendants, the asepsis of the patient, and the asepsis of the instruments and other accessories.

Asepsis of the Physician. The ideal obstetrician should never come in contact with the dangerous infectious diseases, such as scarlet fever, diphtheria, and erysipelas, and should carefully avoid post-mortem work.

While this avoidance of all possible means of conveying infection to a puerperal woman is the ideal in obstetrics, it is, of course, out of the question for the general practitioner who may be obliged to attend a woman in labor shortly after a visit to an infectious case. If this should happen within twenty-four hours of such a visit, he who would do his duty by his patient must adopt certain precautions before entering the lying-in chamber.

It is essential that he should change his garments and thoroughly wash his hands, face, and beard with soap and water.

The hands require more thorough sterilization under these circumstances than is ordinarily necessary.

The hands and arms, especially the region of the finger-nails and the spaces between the fingers, should be thoroughly scrubbed with a nail-brush and soap and water for ten minutes. The soap should then be rinsed off with sterile water, and the hands and arms immersed in a saturated solution of permanganate of potash until the skin turns a dark mahogany-brown. This should be decolorized by the use of a saturated solution of oxalic acid, and the process completed by a thorough scrubbing with 1 to 2000 corrosive sublimate solution with a nail-brush. Even this thorough cleansing of the hands is not infallible, and it is safer to wear rubber finger-cots which have been sterilized by boiling, for the purposes of examination, and to wear rubber gloves during delivery, particularly if the case is

an operative one requiring the introduction of the hands into the uterus.

In other cases, where the hands are innocent of contact with dangerous infectious processes, the conscientious use of the nail-brush with soap and water and their disinfection with 1 to 2000 corrosive or 1 to 100 lysol is in most cases sufficient. There is no question, however, but that perfect asepsis of the hands can be secured only by the adoption of the use of rubber finger-cots or gloves whenever the hand is to be introduced into the vagina.

In cases where the gloves are to be used the sterilization of the hands must be as carefully carried out as if the bare hand were to be employed, since a slight accident may suffice to make a hole in the glove or cot and destroy the protection they afford. In view of the practical absence of infection in the practice of men who understand the importance of asepsis, the use of gloves in delivery seems unnecessary, but it is probable that the little infection which now occurs might be avoided if this last precaution were adopted. For obstetric use it is convenient to use a somewhat heavier glove than is ordinarily employed in surgery.

The same precautions should be taken by the nurse, with the single exception that owing to her long contact with the patient and the difficulty of thoroughly cleansing the long hair of women, it is unwise to accept a nurse who has attended a contagious case within at least a week, and then she should be forbidden to wear any clothing which she has worn during her contagious work. It must be remembered that after the hands of either the nurse or physician have been made aseptic they remain so only so long as they are guarded from contact with any uncleansed surface, and that after the hand has touched any of the furniture or other surrounding objects in the room or any unsterilized part of the patient, it must be resterilized as thoroughly as if it had not been cleansed at all before it can be regarded as clean.

It is well for the physician when in attendance on labor to wear a surgeon's sterilized gown, but if this proves to be too inconvenient, a fair degree of safety can be obtained by pinning over his ordinary clothing as an apron a clean sheet which has been so folded that the surfaces which have been inside as it lay on the shelf are outside when it is in use.

The nurse should be carefully instructed to render her hands thoroughly aseptic before touching the vulva, but as few nurses can be absolutely depended on in the matter of asepsis, it is better to so arrange her work as to prevent her from touching the vulvar region with her hands, except on the few occasions when she may be called on to disinfect it or to make an examination before the arrival of the physician.

The Asepsis of the Patient. The patient when near term should be instructed to be careful at the time of her daily bath to wash the

vulvar region thoroughly with soap and water. When labor is expected the nurse should clip the hair about the vulva and well up on to the pubes as closely as possible with a pair of scissors, it being explained to the patient that this is not only necessary for the prevention of septic trouble, but will prove of the greatest comfort to her during her convalescence, as the discomfort due to the clotting of the lochia upon the hair, with its attendant stickiness and irritation, will be avoided in this way.

Before the first examination is made in labor the vulva and the neighboring parts of the thighs should be scrubbed with soap and water and a nail-brush, or wad of gauze, for at least five minutes, and then with a 1 to 3000 corrosive solution. Care should be taken to leave the cleansing of the anal region until after everything else has been thoroughly scrubbed, since nothing can do more to destroy the efficiency of an attempt at asepsis than to pass a nail-brush or wad of gauze over the anus and then across the vulvar region.

What the intravaginal preparation for examination and labor shall be must be left for the individual physician to decide in a given case. Although there are micro-organisms always present in the vagina, investigation has shown that these, in the absence of purulent infections, are not pathogenic in their nature, and that unless in overwhelming dose the dangerous forms of bacteria are destroyed by the germicidal action of the acid vaginal secretion which is normally produced during pregnancy.

Therefore, in a perfectly healthy woman, douches, etc., before labor are not necessary, since they serve no function, and may even do harm, as according to some observers they vitiate the germicidal power of the vaginal secretion.

When, however, the resisting power of the tissues is impaired by prolonged mechanical injury or by exhausting disease, or by pathological lesions of the mucous membrane, micro-organisms which are usually destroyed may persist and produce septic infection. Moreover, any pathological process which alters the acid reaction of the vaginal secretion destroys also its germicidal power and renders it of no use in destroying bacteria. The logical inference is that in absolutely healthy patients douches are unnecessary, while those in whom a pathological process has produced an abnormal vaginal secretion require douching sufficient to remove the diseased secretion and to make the parts as nearly normal as possible.

The albuminoids in the mucus and pus form an insoluble compound with mercurial solutions; therefore, douches of corrosive sublimate are of inferior value in cleansing the vagina and removing the secretions. The best preliminary douche is a solution of green soap, or its tincture in watery solution, to cleanse the vagina, followed by a douche of 1 to 100 lysol or some similar compound. Lysol is especially useful, as it supplies a lubricant for the vagina in place of the

vaginal secretion which is removed by the douche. In doubtful cases it is perhaps best to err on the side of safety, and carefully douche out the vagina, though this may be unnecessary in many cases.

Whenever it is necessary to introduce the hand into the uterus in the course of an examination, or for any operative procedure, the vagina should be thoroughly scrubbed with a wad of sterilized gauze or absorbent cotton, with a solution of green soap, before the douche is given. After delivery the douche may be repeated, and if the hand has been introduced into the uterus the uterine cavity may be douched out. For the post-partum douche a bichloride solution is to be preferred to lysol, on account of the danger of carbolic-poisoning from absorption of lysol from the uterus. Either, however, may be followed by a douche of sterile water if desired. The action of the post-partum douche is probably principally mechanical, but it serves to wash out the collected blood clots, etc., from the vagina and to remove any germs which may have been introduced during delivery and examination.

Asepsis of the Accessories of Labor. All instruments which are used in obstetrical work should receive the same attention as for any surgical operation.

Before being used they should be boiled for at least ten minutes. It is not necessary to carry a sterilizer for this purpose, as any clean cooking utensil will do. If a small teaspoonful of cooking soda be added to the water it will prevent the instruments from tarnishing. When ready for use they should be laid, still wrapped in the towel in which they were boiled, on a table convenient to the operator's hands, and should be opened by the operator only after his hands have been sterilized for the operation.

Gum-elastic catheters can only be sterilized by long immersion in corrosive sublimate solution.

The pieces of absorbent gauze or waste which are to be used as sponges during delivery, and the vulvar pads which should be worn during the labor and after-treatment, should be sterilized by steaming for at least half an hour in an ordinary steam collander if there is one in the kitchen. If time permits this should be repeated twice at intervals of twenty-four hours, but in cases of emergency a single steaming will probably be sufficient.

If there is no suitable utensil in the house for steaming, they may be sterilized equally well by immersion in boiling water for the same length of time. In either case they should be wrapped in a towel or several thicknesses of gauze and dried by being placed in a moderately warm oven. The same precautions should be followed in the preparation of the sheet which is to be worn as an apron by the physician, and of the towels and sheets that may be used during delivery to cover the patient.

If vaseline is to be used as a lubricant it may be sterilized by heating it until it boils, or, if its receptacle permits, by boiling it in water.

After the delivery of the child the placenta should be expressed by Crédé's method, and unless the perineum is lacerated care should be taken that nothing is allowed to separate the vulva or enter the vagina. At the conclusion of labor the vulva is again thoroughly scrubbed, and the douche may be repeated. A sterilized pad of absorbent cotton or cotton waste, wrapped loosely in cheese cloth, is then placed over the vulva and secured in position by an ordinary napkin. This is changed whenever the patient passes urine or feces, and about once in six hours as a routine measure. At each change of pads the patient is placed upon a bedpan and the vulva sprayed off with bichloride solution through a watering-pot nozzle.

If the use of the catheter becomes necessary, the catheter, the region of the meatus, and the hands of the attendant who is to pass it, should be carefully cleansed with the same solution.

The observance of these few precautions has produced remarkable results in obstetrical practice, and in the experience of all who have carefully followed them, has greatly decreased the anxieties of the puerperium.

After the birth of a putrid fœtus or when the hands or instruments have been passed into the uterus, the uterine cavity may properly be flushed out with an injection of 1 to 5000 bichloride solution, followed by sterile water. This precaution is also advisable after the birth of a macerated fœtus and in any operative case where a flaw in asepsis has been observed.

It may be objected that the after-treatment described requires special training on the part of the nurse. It is, however, so simple that it may safely be entrusted to any fairly intelligent and unprofessional attendant. In that class of practice in which the family of the patient cannot be expected to do even fairly intelligent work, it is a fact that although the best results are only obtainable by the full observance of these precautions, still if the labor be aseptically conducted and all meddling with the vagina be avoided during convalescence, a practical immunity from all but the mildest grades of septic infection can be expected.

PREPARATIONS FOR LABOR.

The Lying-in Chamber. When circumstances render a choice of rooms possible, that which is selected as the lying-in chamber should have certain qualifications. It should be situated at a distance from the water-closet and should not contain a set basin, so that the ordinary dangers attendant on defective plumbing cannot affect the

patient during her convalescence. The room should be well ventilated, and should contain an open fireplace or a stove, so that in cold weather it is independent of the rest of the house for its heat. In winter it is desirable that the room selected should be on the sunny side of the house, and in summer on the shady side. In ordinary cases it is unnecessary and impracticable to remove the carpet, pictures, etc., from the room, as is sometimes proposed; but the room should be thoroughly swept and cleaned and aired. The curtains and other hangings should be reduced to as small a number as is consistent with the comfort of the patient.

Obstetrical Bag. It is highly conducive to the performance of exact and careful work in obstetrics to have all the instruments and materials necessary for the successful conduct of a case of labor collected together in one bag, and if the destructive instruments be excluded, an ordinary handbag is large enough to contain everything. It is convenient to keep the instruments needed for craniotomy and decapitation together in a separate bundle, and to keep ready in a single bag the instruments which are necessary for ordinary cases.

A description of the bags which are used in the Out-patient Department of the Boston Lying-in Hospital will suffice to show about what is needed for an ordinary case. These bags have proved adequate for the administration of a large clinic, and, with the destructive instruments which are carried in a separate package, comprise everything that is necessary for any ordinary case in private or consultation practice. They weigh about ten pounds altogether. The bags are fifteen inches long, six inches wide, and six inches high.

Their contents are as follows:

Drugs. One bottle of corrosive sublimate tablets; 1 ounce 95 per cent. carbolic acid; 1 ounce fluid extract of ergot; one bottle of flexible collodion; tablets of chloral hydrate; 2 ounces of lysol; one powder blower of powdered iodoform. These bottles may be enclosed in the tin mailing cases which can be obtained from any apothecary for a few cents.

Ether, brandy, and sterile waste or gauze should be included in the bag, unless the patient is known to have provided them.

Instruments and Other Accessories. Two nail brushes; one No. 9 or No. 10 English gum-elastic catheter (a new one should be provided for each case); one Davidson or fountain syringe with rectal and vaginal nozzles; one pair of scissors; two pairs of forceps; six pairs of hæmostatic forceps; needle holder; two copper strip retractors for the perineum; straight and curved needles for repair of the perineum or cervix; one pair of Volsella forceps; one pair of Braun's modification of Simpson's forceps with Reynolds' axis-traction rods; a scale for weighing the baby; a hypodermic syringe; a stethoscope; a pair of tongue forceps and wooden gag; a pelvimeter.

For use in packing the uterus in case of hemorrhage: one pair of

uterine dressing forceps; one jar or package of sterilized strip gauze (five yards).

For saline infusion: one canula; one scalpel; one director; filter paper; one medium sized aspirating needle; a clean fountain or Davidson syringe can be used in giving the infusions.

Sutures. One box silkworm-gut; one tube chromicized catgut or other reliable preparation of catgut; one skein of bobbin, cut into 18-inch lengths, for use in tying the cord; one piece of broad linen tape for use as a fillet.

PREPARATIONS FOR DELIVERY.

When the attendant is satisfied that labor has actually begun and is likely to go on, the following articles should be got together on a table so as to be ready when needed: two basins, one for soap and water and one for the antiseptic solution, corrosive or lysol as the attendant prefers; two nail brushes and a quantity of small wads of some sterilized absorbent material for use as sponges. The Davidson or fountain syringe should be prepared and laid ready for use. This table should be placed by the side of the bed in such a position as to be within easy reach of the attendant on the side he prefers. On another table should be placed ether, brandy, a hypodermic syringe, sterile gauze for packing the uterus, and, as delivery becomes imminent, a basin containing ice, which should be broken into pieces rather smaller than the fist.

Two pails or other vessels large enough to hold the child should be placed near at hand, and filled, the one with hot water and the other with cold water, as soon as it seems probable that the child will be born within half an hour.

It should be ascertained that there is a good fire in the kitchen, and plenty of hot water for sterilizing the instruments or for any other purpose that may be necessary. These preparations really belong to the province of the nurse, but the physician should make sure that they have been attended to.

Bed. The preparation of the bed, the superintendence of the patient's dress, etc., belong properly to the province of the nurse, but in case she is absent from any cause they may fall to the share of the physician, who, of course, is expected to be thoroughly conversant with all these details. The bed should be prepared for labor by protecting the mattress from the fluid discharges by spreading a piece of rubber sheeting over it, or in the absence of this a rubber circular or a piece of oil-cloth. When all conveniences can be had, the bed is best prepared by covering the mattress with a large piece of rubber sheeting, with the smooth or waterproof side up. Over this a sheet is spread, and over this a smaller piece of rubber sheet-

ing, again with the waterproof side up, covered in its turn by a draw sheet, so arranged in the bed that its middle comes under the hips of the patient.

As it is desirable that the physician should be able to show himself an expert in all the practical details, it is not out of place to speak briefly of the proper method of spreading the sheets upon the bed. Each sheet is made with a broad hem across one end and a narrow one across the other. The broad hem is always placed at the head of the bed, and in spreading the under sheet that side of the hem on which the stitches show should be placed next the mattress, while with the upper sheet this side should be uppermost, so that when the sheet is turned down over the blankets the smooth side appears.

Dress of the Patient. During the first stage of labor the patient is most comfortable if dressed in a loose wrapper or bed-gown, worn over the night-shirt. Throughout labor most patients prefer to wear stockings. As the second stage begins the patient should be so prepared for delivery that as little soiling of the bed and night-clothes as possible may result. To accomplish this the night-gown should be rolled up as high under the patient's arms as possible and fastened there by tying it in place with a piece of tape passed around each shoulder. Exposure of the patient is to be avoided by adjusting a sheet in the following manner: The sheet should be so folded that its width is a little greater than the circumference of the patient's waist, and its length about that of her ordinary skirts. A piece of tape should be passed through the fold and tied around the patient's waist in such a way that if she is to be delivered, as is usual, lying on the left side, the opening in the sheet corresponds to the right hip. The unbroken side of this apron is then under the patient at the time of delivery, and if the night-shirt has been properly fastened up out of the way, it is usually possible after labor to remove the sheet without soiling the night-gown, and the patient is spared the annoyance and exposure of a change of clothing. It is decidedly a comfort to the patient if, from the time that labor begins, she wear a napkin such as is ordinarily worn at the menstrual period, and it is a wise precaution to place the obstetrical vulvar pad inside this as soon as the initial douche has been given.

CHAPTER XI.

NORMAL LABOR.

PHYSIOLOGY AND MECHANISM OF NORMAL LABOR IN ANTERIOR POSITIONS OF THE OCCIPUT.

LABOR is commonly divided into three stages. The first stage, or stage of dilatation, extends from the beginning of labor to the time when the os is fully dilated or dilatable.

The definition is simple, but in practice it may be difficult to draw a sharp line between the first and second stages, and perhaps a better description of the first stage is that it lasts as long as the resistance of the os is the obstacle to the progress of labor, thus relegating to the second stage the not uncommon case in which the os remains undilated from simple lack of pressure, the membranes being ruptured and the head delayed by a malposition or other obstacle.

The second stage, or stage of expulsion, begins with the full dilatation or dilatability of the os, and ends with the expulsion of the child.

The third or placental stage lasts from the delivery of the child to the expulsion of the placenta.

Since a presentation of the vertex, occiput left anterior, O. L. A., occurs in two-thirds of all labor cases, the description of normal labor will be given as a matter of convenience under that heading, and the variations which are due to the occurrence of other positions will be given separately.

Phenomena of Normal Labor.

During the last two weeks of pregnancy certain changes take place. The abdomen becomes less prominent, and decided relief from all the symptoms arising from the encroachment of the uterus on the abdominal and thoracic space occurs, with the single exception that the frequency of micturition often becomes decidedly increased.

This phenomenon, commonly known as the "lightening of pregnancy," is usually most marked in primiparæ, and is due to the descent of the head into the pelvis, under the influence of slight painless contractions, which are merely an increase of the rhythmical action of the uterine muscle which is constantly observed throughout pregnancy.

The advent of labor may be announced by a sudden and unexplained rupture of the membranes, which occurs probably at the

acme of one of these unperceived contractions, but labor more commonly begins with the appearance of abdominal pains occurring at infrequent and slightly irregular intervals, known as the "dolores presagientes." These irregular pains are due to increased uterine contractions, but have little effect on the dilatation of the os.

The pains at first are short and teasing, usually situated in the small of the back, and occur at intervals of fifteen minutes or more. As labor progresses they occur at shorter and shorter intervals, and constantly increase in severity and duration. Although the later pains are in reality much more severe than the earlier ones which usher in labor, they usually cause less annoyance to the patient.

As the pains grow stronger their character changes. They begin in the small of the back and extend around into the abdomen. They become more regular, and last longer, while the intervals gradually shorten. Little progress in dilatation is likely to be made until the pains have become regular, but when this has occurred, when the cervix begins to be shortened and the os to be dilated, true labor is usually present.

After rupture of the membranes true labor invariably comes on, though hours or even days may elapse before it begins. The "dolores presagientes" are apt to be mistaken by the patient, especially if a primipara, for an attack of intestinal colic, and the attendant must bear in mind that such a complaint from a patient near full term commonly marks the beginning of labor.

False Labor. The term false labor is properly restricted to the appearance during the later months of pregnancy of pains which, though distressing to the patient, have little or no effect on the cervix and os.

They are to be treated, if at all severe, by the administration of bromide or chloral, by rest, and the adoption of such other hygienic measures as tend to depress nervous excitability. The term is also, though less properly, applied to cases in which labor pains start up prematurely and effect some dilatation of the os, but disappear and are succeeded by recontraction of the cervix, either spontaneously or as a result of the use of rest and opiates. This phenomenon is most commonly observed in multiparæ, but may occur in first pregnancies.

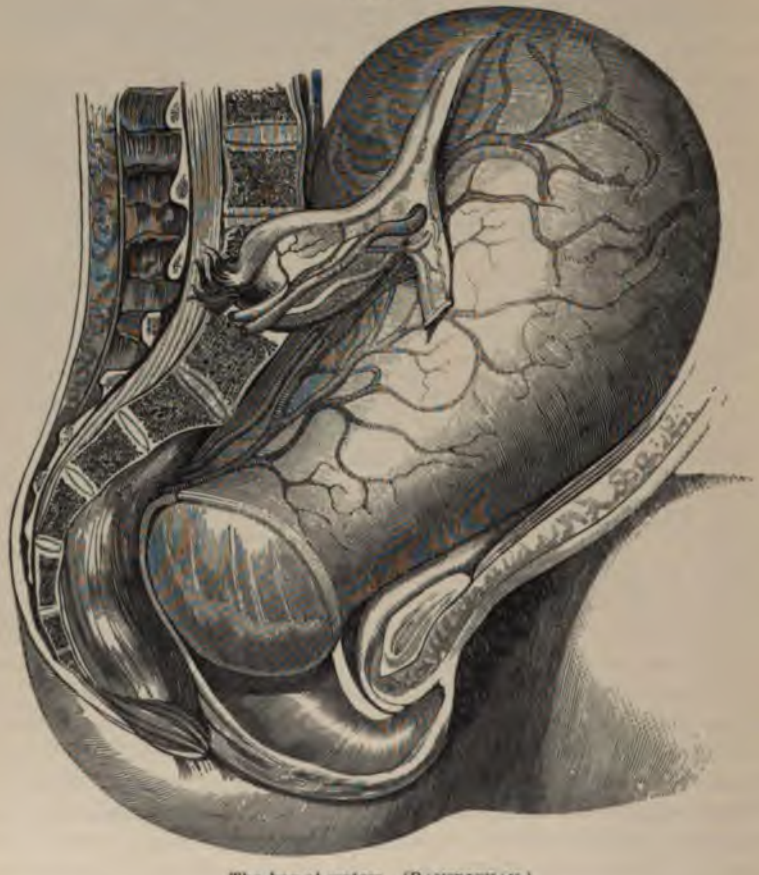
First Stage. The dilatation of the os is best accomplished by the membranes, which should, therefore, be preserved intact until the dilatation is practically complete. It may occasionally happen that a discharge apparently of amniotic fluid has been noticed, while on vaginal examination, presumably intact membranes are found presenting. This may be accounted for in two ways :

1. A small rupture may have occurred high up in the amniotic sac, resulting in the discharge of a small quantity of liquor, and the opening may have subsequently been closed by the retraction of the uterus or by the settling of some part of the fœtus against it.

2. In the majority of such cases the liquor which has escaped was in fact a collection between the two layers of membranes, the outer of which was ruptured and allowed the accumulation to escape, while the inner, and usually tougher, layer remains unruptured and retains within it the true liquor amnii.

The efficiency of the membranes as a means of dilating the os depends largely on the extent to which they bulge through the os

FIG. 49.



The bag of waters. (RAMSBOTHAM.)

under the pressure of the uterine contractions, according to the physical law that fluid exerts equal pressure in all directions. The conditions which promote this bulging are sufficient elasticity of the membranes themselves, freedom from adhesion between the membranes and the lower segment of the uterus, and a free communication of that portion of the waters which is contained between the head

and the presenting part of the membranes—*i. e.*, the fore-waters, with the main body of waters behind the head. It is evident that if the membranes are adherent to the edges of the internal os, or if the head is in direct contact with the membranes and so closely crowded down into the tense lower segment as to form a ball valve and prevent the descent of the waters, no bag of membranes can be formed, and the dilatation must be performed by the pressure of the head without the aid of the elastic membranes.

The firm rounded head, which is inelastic, naturally is a less efficient dilator than the elastic membranes filled with fluid, for not only is it too large to enter an undilated os, but it can only exert pressure directly downward, whereas, the elastic bag of membranes can be forced into a practically undilated os, and then exert lateral pressure on the os as well as downward pressure through it.

When it is found that there are no fore-waters, in spite of the fact that the membranes are intact, the finger should be passed as far as possible between the os and membranes, and swept around the whole

FIG. 50.

Diagram of the action of the membranes in producing dilatation.

circumference in order to break up any adhesions which may be present. If the membranes still fail to bulge, the head should be gently lifted up with the fingers and a portion of the waters allowed to pass by it and form the fore-waters.

In primiparæ in whom the head has already entered the pelvis, the cervix is sometimes found to be so stretched around the undilated os as to form an almost membranous hood over the presenting part. In this condition the formation of a bag of fore-waters is impossible, and the muscular fibres of the cervix are so paralyzed as to be incapable of exerting traction on the edge of the os. This usually results in so pronounced a stasis of labor as to require manual dilatation of the os, but since the forced stretching of such an os usually, if not invariably, involves extensive lacerations of the cervix, it should only be attempted in the presence of distinct indications. The condition is referred to here in order to suggest the necessity of caution lest the finger should overlook the presence of an undilated, thin-edged os,

and the belief be entertained that dilatation being complete, the second stage has begun. The results of an application of forceps to the substance of the cervix can be readily understood.

In certain cases the toughness and elasticity of the membranes may be so great as to result in their persistence after the dilatation of the os is complete, and in their descent into the vagina, and even into the external world, by dilatation of the vulva. In exceptional cases the birth of an intact ovum has been observed even at full term. This phenomenon is normal in many of the lower animals, and has been regarded by some as desirable in the human race, but it is gener-

FIG. 51.

Left occipito-posterior position. (PARVIN.)

ally believed that the function of the membranes is accomplished when dilatation of the os is complete, and that they should be ruptured at this period by the attendant, unless rupture occurs spontaneously.

In cases where the membranes rupture before the termination of the first stage, dilatation must be effected by the descent of the head, a process which is always slower and which is more liable to result in laceration of the cervix. The length of the first stage in any event varies greatly in different cases, and is usually greater in primiparæ than in multiparæ. In practice, however, the length of labor should be computed not by the lapse of time alone, but by an estimate of the

amount of force which has been expended in connection with the time, since patients are usually less exhausted by slight pains of several hours' duration than by severe and vigorous contractions during a much shorter time. The vigor of the contractions should be estimated by the amount of caput present and by observation of the tension of the uterus and membranes during contractions, as determined by abdominal palpation and vaginal examination. The complaints of the patient are wholly unreliable guides. Exhaustion is dependent on the strength of the pains and on the amount of suffering, and only secondarily on the length of time spent, and can be better estimated by observation of the pulse of the patient than in any other way.

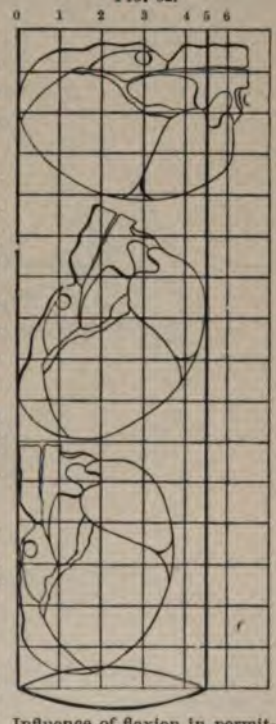
In multiparæ the head often remains high and free above the brim until rupture of the membranes occurs, and then descends to the perineum during one or two of the first succeeding pains.

It must always be remembered that in any case the uterus may be in a state of tonic contraction after a very few hours of first stage labor, before any marked dilatation of the os has been accomplished, and that the exacerbations of this tonic contraction may be mistaken for the slight pains of normal first-stage labor. The diagnosis of this condition is to be made from the irregular appearance of the so-called pains and from the rigidity of the uterine muscle, which is evident on palpation of the fundus.

Second Stage. The second stage of labor is usually divided into three subsections: The descent of the head, the expulsion of the head (perineal stage or stage of expulsion), and the delivery of the body.

DESCENT AND FLEXION. With normal relations between the mother's pelvis and the child's head, descent can only occur after flexion has been attained.

FIG. 52.



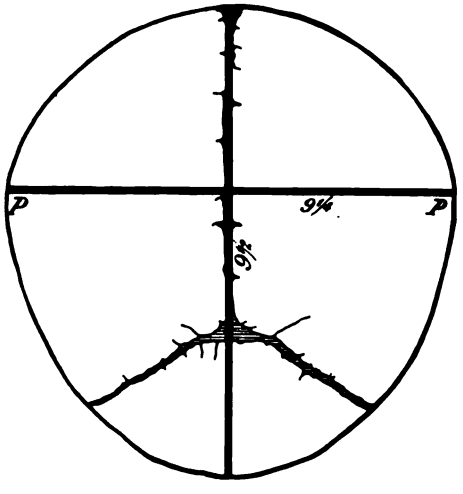
Influence of flexion in permitting descent. (KING.)

The head usually presents at the inlet in a position midway between flexion and extension, but as soon as descent begins flexion occurs. This is due to the pressure exerted on the head by the pelvic walls, owing to the mechanical relations of the head. The articulation of the head and neck at a point near to the occipital end of the head results in the formation of a lever with two arms of unequal length, the anterior or frontal being the longer. In its descent through the superior strait the head is subjected to equal pressure throughout its

girdle of contact with the pelvis; but this pressure is, of course—the neck being the fulcrum—more efficient on the longer or frontal arm of the lever than on the shorter or occipital arm, which naturally descends more rapidly, since it meets with less efficient obstruction, and thus produces flexion. The flexed head then descends in the oblique diameter of the pelvis until it meets the resistance of the pelvic floor, when the occiput, which is the leading point, rotates forward in the direction of least resistance.

ROTATION. The occurrence of rotation is due to the fact that the occiput, being the lowest point of the head, is the first to reach that portion of the pelvis where the changed axis of the canal makes a change in direction necessary. At this point the posterior walls of

FIG. 53.



The length and breadth of the fœtal head. *P P.* Biparietal diameter. (DAVIS.)

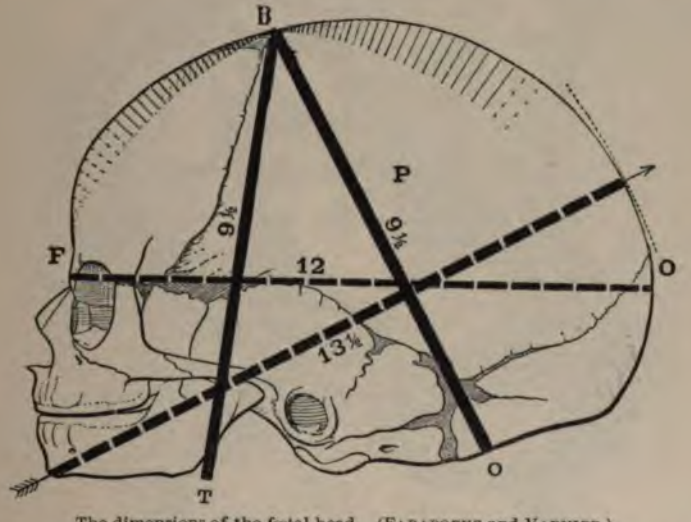
the pelvic canal are formed by the resistant sacrum and coccyx, the sides are formed by the ischial rami, and the point of least resistance is in front, the resistance in that direction being merely that offered by the yielding vulva. The bony planes of the lower part of the pelvis slope forward in the general direction of the vulva, and it follows that the occiput resting on the shelving planes naturally rotates forward to the arch under the influence of the propelling forces of the uterus, following the line of least resistance. The occiput is now resisted only by the soft vulva, and the biparietal diameter is below the edge of the pubic arch.

The sinciput, on the other hand, is still in the upper part of the pelvis, where it is subjected in front and on the sides to the close bony pressure of the lateral walls, while behind it is in apposition

with the considerable space afforded by the sacro-iliac notch, which is filled with soft and yielding tissues.

The occiput being exposed to excess of pressure behind and meeting little resistance in front, and the sinciput being exposed to pressure in front and meeting little resistance behind, the result is rotation of the occiput forward and of the sinciput backward, provided the uterine contractions are adequate to force the head onward. It must be borne in mind that this rotation is dependent on flexion, and that if flexion be lost and the sinciput and occiput occupy approximately the same plane of the pelvis, both are exposed to an excess of pressure upon the same side, and there is nothing to cause rotation.

FIG. 54.



The dimensions of the fœtal head. (FARABOEUF and VARNIER.)

O F. Occipitofrontal diameter. O B. Suboccipitobregmatic. B T. Trachelobregmatic. The maximum diameter is indicated by the long dotted arrow. Measurements are in centimetres.

When these forces have brought about rotation, the occiput sinks into a lower position in the pelvis and enters the gutter formed by the lower part of the sacrum and the muscles of the perineum. It is then held in its anterior position by the lateral pressure of the ischial tuberosities, and further rotation is impossible; and since the head as a whole lies against the shelving surface of the sacrum, coccyx, and perineum, the movement of expulsion begins.

EXPULSION. The occiput is now free from all but lateral pressure, but the frontal end of the head still rests at the bottom of a gutter formed by the shelving posterior wall. As the child is pressed downward by the uterine contractions the sinciput is in its turn forced forward along the gutter, driving the occiput before it. The motion

of the head during this stage is directly forward until the occipital protuberance escapes from under the edge of the symphysis. The occipital end of the head is now free from pressure, the neck is arrested by the pubic arch, and the continued forward movement of the frontal end of the head under the influence of the intra-uterine forces results in extension of the head upon the trunk, by which the forehead, face, and chin are successively swept over the fourchette

FIG. 55.

Diagrammatic view of mechanism in a left occipito-anterior position of a head presentation. (LEISHMAN.)

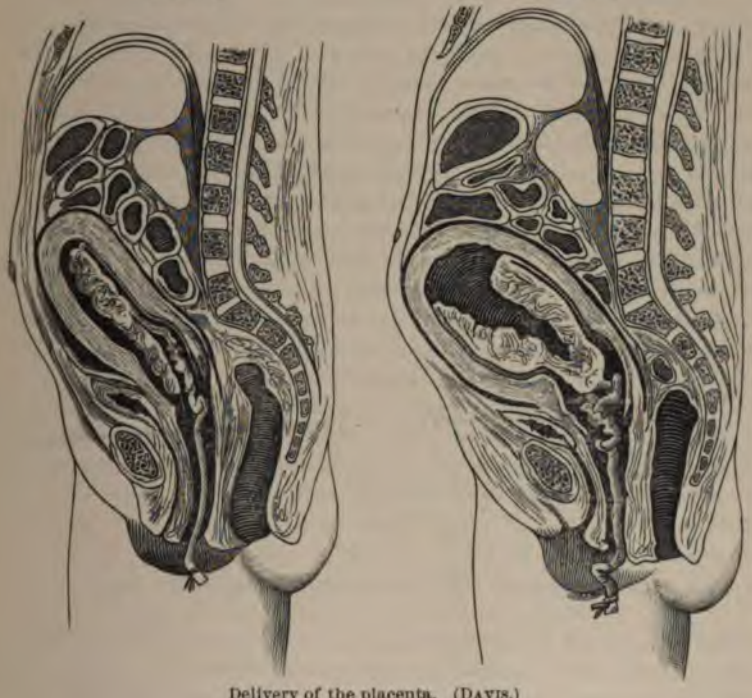
and brought into the world. This movement of extension begins at about the time that the large fontanelle appears at the edge of the perineum.

DELIVERY OF THE BODY. At the time when the head emerges, the shoulders are still in the pelvic canal, which they, of course, usually enter in the opposite oblique diameter from the head, and as the continuance of the contractions drives them onward, their rotation

under the same forces which caused rotation of the head, results in the movement which is known as external rotation, or restitution, of the head and by which the occiput is made to turn again to the side on which it originally was.

The shoulders then move forward under the influence of the pelvic plane, until the perineal shoulder appears at the vulva. By a continuance of the same motion the anterior shoulder is released from the pubic arch, and upon the disengagement of the shoulders the whole body follows rapidly.

FIG. 56. FIG. 57.



Delivery of the placenta. (DAVIS.)

Third Stage. After the delivery of the child the uterine contractions commonly cease for a short time, but after the expiration of a few minutes they begin again. During this interval retraction of the uterus is steadily going on. Retraction consists in a re-arrangement of the fibres of the uterus which have been stretched to contain the ovum, combined with a shortening of each individual fibre. As the uterine contents are gradually forced downward, retraction begins at the fundus; between each contraction the muscular fibres which have been arranged end to end re-arrange themselves side by side. This results in a thickening and shrinking of the uterus, and goes on

gradually all through labor without disturbing the rhythmical quality of the pains, since the amount of change is small at each contraction. When the contraction which results in the expulsion of the child occurs, the sudden diminution in bulk of the uterine contents is entirely out of keeping with the speed of retraction, and an interval occurs while the uterus is retracting sufficiently to act on the comparatively small placenta.

As soon as sufficient retraction has taken place the pains begin again, and a few contractions suffice to drive the placenta into the vagina. The muscular contractions of the vaginal walls force it onward, and it finally dilates the perineum and sweeps forward in the curve of Carus, as does any object that is born from the vagina.

The mechanism by which the placenta is freed from the uterus has been described in two ways, both of which probably occur.

In some cases the decrease in size of the uterine walls tears away the placenta and membranes from their attachments at once, and the placenta is then driven into the vagina edge foremost by direct pressure from the uterine wall upon its substance. In other cases it is probable that the blood poured forth from the uteroplacental sinuses accumulates behind the partially detached placenta until the mass has attained sufficient size to excite the contractions of the uterus, which then drive the doubled-up placenta and membranes into the vagina under the influence of the fluid pressure of the retained blood.

The question as to the relative advantages of these two methods of expulsion is interesting and has led to much discussion, but the only practical point is that more force is required to expel the placenta in its expanded form than when it presents by its edge, so that in cases of manual extraction it is always best to withdraw it in the latter manner.

Management of Normal Labor. Occiput Anterior.

First Stage. When the physician is first summoned to the bedside of the parturient woman he should remember that the patient, especially if she is a primipara, is worried and anxious, and full of apprehensions about the pain she is going to suffer and the possible dangers of labor.

Therefore, he owes his first duty to her mental rather than to her physical condition. Much information may be gained by simple inspection of the patient, and if the stage of labor permits, it is better to spend a few minutes in conversation with her than to hurry at once to the usual examinations. He should endeavor to assume a calm and thoroughly matter-of-fact manner, which will convince her that he, at least, is unflurried and expects nothing unusual.

He should feel the pulse, note the condition of the patient's nervous system, the frequency and character of her pains, and, unless

he is already familiar with it, try to form an estimate of her probable strength and constitution. When he has succeeded in quieting the patient's fears and in accustoming her to his presence, he should palpate and auscult the abdomen carefully, and then make the usual vaginal examination after disinfecting his hands. He is now expected to assure the patient that everything is all right—*i. e.*, that there is a head presentation, and no unusual difficulty is to be apprehended.

If for any reason it is impossible to give this assurance conscientiously, the greatest care should be taken to avoid any direct statement in the presence of the patient that anything is wrong.

If a malpresentation or other abnormality exists, it is essential to the physician's reputation taht the husband or some other responsible relative should be informed of it at once, being directed at the same time not to tell the patient.

One of the first questions which is usually asked the physician is in regard to the probable length of labor; but this can only be answered by the assurance that all progress is dependent on the quality of the pains, and that this is so uncertain that no opinion of any value can be offered on that point. It is usually best to give the most hopeful view possible to the patient, without committing one's self to an exact statement. If the question is asked, not by the patient, but by the husband or other members of the family, it is best to state the case to them exactly as it appears, since an assurance to them that the labor is likely to be short and easy is liable to be interpreted as a confession of ignorance in case of subsequent delay.

The conditions which make rapid progress probable are the existence of strong pains at regular and not very long intervals; the fact that the os is soft, and that a considerable degree of dilatation has been reached in a short time ; that the head is not very high in the pelvis; that the pelvis is normal in size; that the membranes are intact and bulge freely through the os, and that the patient, if a multipara, has a history of rapid confinements on previous occasions. The opposite conditions, of course, predispose to delay. The best type of pains is when the intervals average about two minutes, and the pains about three minutes, but this is seldom attained until during the second stage.

It is rarely necessary, or indeed advisable, for the physician to remain in the house continuously during a long first stage, and the question whether to remain within call at any given stage of dilatation must always be decided by an estimate of the amount and rapidity of the progress which has been made up to that time. If true labor is present it is not wise to absent one's self for more than two or three hours at a time. It is best that the first visit should be at least of an hour's duration, and that before leaving a second examination should be made, in order that an intelligent judgment of the rapidity of

progress may be made. In all cases the early stages of dilatation consume much more time than the later, and it may be laid down as a general rule that continuous attendance is seldom necessary with primiparæ until the os has reached the size of a silver dollar, though with multiparæ it is unsafe to be absent any length of time after the os has been dilated to the size of a quarter.

Under normal circumstances, the treatment of the first stage is largely expectant. The physician should maintain an attitude of watchfulness, should be on the lookout for the first sign of delay or abnormality, and should refrain from interference so long as steady progress is being made.

If sufficient care be used, the diagnosis of presentation and position can usually be made at the first visit. The importance of an early diagnosis can hardly be exaggerated, since malpositions which could be easily corrected at an early period of labor may often, if neglected, require the more serious obstetrical operations.

If the first examination fails to afford a satisfactory diagnosis of the presentation or position, it should be repeated at frequent intervals until that object has been attained. If, as occasionally happens, repeated abdominal and vaginal examinations fail to afford a satisfactory diagnosis, the conduct of the physician must be determined by the progress of the case. If dilatation and descent go on with normal rapidity, he is usually justified in waiting for the rupture of the membranes without resorting to any more heroic means of diagnosis. If, however, the diagnosis of presentation, or even of position, cannot be made, and the progress of the case is unsatisfactory, the attendant is always justified in a somewhat early resort to the more efficient methods of diagnosis, which will be referred to under the head of difficult or delayed labor.

If, after full dilatation has been accomplished, the membranes fail to rupture spontaneously, they should be torn by the attendant. If the head is not engaged, this should be done in the interval between the pains, since rupture of the membranes and the consequent sudden escape of liquor amnii during a contraction might easily in this case result in prolapse of the cord, an accident which would seriously compromise the safety of the child.

If the head is well engaged the presenting part of the membranes should be ruptured at the height of a contraction by gentle scratching with the nail of the examining finger, or by seizing a portion between the tips of the two fingers and tearing it with a gentle twisting motion. Should these methods fail a sterilized probe, director, or any similar instrument may be passed through the membranes under the guidance of the finger.

If the head is free above the brim and it seems possible that its lack of descent may be due to the existence of some mechanical obstacle other than the resistance afforded by the elastic membranes, the

membranes should be preserved intact and a high examination made, under ether if necessary, to discover the cause of the delay. If no other cause is found, the membranes should be torn with the fingers in the interval between the contractions, the head should be brought into the brim by the combined action of the internal and external hands, and the escape of the waters should be thus regulated and the descent of the cord prevented by the internal hand, which should be retained in the vagina until the engagement of the head has been effected. If any mechanical obstacle to the descent of the head is found, the case should be treated according to the indications which it presents, as will be described in the chapters on operative delivery.

During the first stage it is unwise to annoy the patient by too frequent examinations, and the physician should endeavor to so time them that he can confidently expect to note decided progress on each repetition. Each examination should include an auscultation of the fœtal heart, for it must not be forgotten that the obstetrician is in charge of two patients, and is responsible for the life of the fœtus, as well as for that of the mother.

The position of the patient during the first stage should depend largely upon her own preference. Labor usually progresses more rapidly if the patient retain the erect position, and from time to time move about the room; but this should not be insisted on if it is evidently fatiguing to the woman, nor is it usually best to require its continuance after the pains become so severe that the patient feels the necessity of support during their presence.

During labor few patients are conscious of appetite or ready to take food, but during long first stages it is important to prevent exhaustion and faintness by the occasional administration of broths or other simple nourishment, though, in view of the possible necessity for etherization, it is better to prohibit undiluted milk and solid food.

The physician should remember to absent himself from time to time in order to permit the patient to pass urine, and he should inform himself if this is done, since a distended bladder is perhaps the most common cause for delay in labor. If there is any question as to the completeness with which the patient has emptied her bladder, it is always best to catheterize. The general principle which should be observed throughout the management of the first stage of labor is non-interference so long as normal progress is present, and a careful watch to be in readiness to interfere before the advent of exhaustion. The patient should be urged to avoid unnecessary efforts, and should especially be cautioned against all voluntary bearing down during the contractions, an effort which, during the first stage, not only fatigues the patient without any compensatory benefit, but tends to produce extensive cervical lacerations. Moreover, it must not be forgotten that while physical exhaustion is promptly shown by a rising pulse, there is in all women a possibility

of fatigue of the nervous system, which must be guarded against with equal care.

The danger of a nervous breakdown is to be anticipated from the behavior and general aspect of the patient, and from her mental condition rather than from any physical signs; thus the sudden and marked appearance of irritability, nervousness, and short temper in a previously good-natured woman is during labor a phenomenon of some significance, and should lead to active interference, since it is apt to be the first sign of impending danger, and may be followed, if neglected, by the development of uterine inertia, eclampsia, or other complications.

The treatment of nervous exhaustion in labor consists in the removal of its cause by the rapid termination of labor, should that be necessary, and the use of nervous sedatives. For this purpose there are two drugs which are pre-eminently of value. During the earlier portion of the first stage, and when there is in all probability a considerable length of time before the woman, hydrate of chloral is often of the greatest value, especially as the existence of labor affords a toleration for this drug in doses which would be dangerous or even fatal to the non-parturient woman. The best method of using it is by the administration of 15 grains, if given by mouth, or 20 grains by rectum, in solution of checkerberry water or some other vehicle, to be repeated twice if necessary, at twenty-minute intervals. This total of 45 grains by mouth or 60 grains by rectum should never be exceeded. The second or third dose is followed in the majority of cases by drowsiness and sleep of some hours' duration, after which the patient usually awakes in a greatly refreshed condition, and labor often proceeds with considerable activity; its use should, however, be restricted to cases in which there is so little hope of immediate progress that the loss of a few hours is of less importance than the refreshment obtained from sleep.

If, on the other hand, the os is fairly well dilated, the pains strong and regular, and the second stage at hand, chloral commonly fails to give relief, so that in such cases it is better to withhold this drug and substitute for it the obstetrical use of ether—*i. e.*, its use to the point of toleration of pain without loss of consciousness, in contradistinction to its surgical use to full anæsthesia. The patient should be furnished with a cone or folded towel and allowed to give the ether to herself, being placed, however, in such a position that the cone will drop as soon as the grasp of the hand relaxes. The physician or nurse should sit by her side in readiness to restore the ether to her whenever the pains arouse the desire to renew it. Ether given in this way has, in the majority of cases, no ill-effect on the progress of labor, and may be administered for many hours, to the great comfort of the patient and without ill-results. When the cervix is in a state of spasm ten minutes full surgical anæsthesia, in combination with the

lightest possible manual dilatation of the os, will often relax the spasm and ensure rapid progress.

Second Stage. We often receive a hint of the beginning of descent of the head by a marked change in the cry of the patient during the

FIG. 58.

The cranium distending the pelvic floor. (FARABOEUF and VARNIER.)
B. Anterior fontanelle. *S. O.* Suboccipital region.

pains. The cry of the first stage is that of an irritated, discouraged woman, who despairs of any relief, while the cry of the second stage

FIG. 59.

The cranium distending the pelvic floor. (FARABOEUF and VARNIER.)

is a peculiar groan expressive of bearing-down effort, and often full of renewed energy. As soon as this change is perceived, or when vaginal examination shows that full dilatation is accomplished, the

expectant attitude should be abandoned and every effort made to encourage the bearing-down efforts which have been prohibited before. The patient, if previously about the room, should be put to bed, and a rope or folded sheet should be tied to the foot of the bed near her feet, so as to furnish a fixed point on which she can pull during her pains, an effort which is agreeable to most women, and which encourages voluntary efforts by fixation of the costal origins of the auxiliary abdominal muscles. She should be encouraged to hold her breath and bear down during each contraction, care being taken, however, to prevent such violent exertions as to exhaust her muscular powers too early. Throughout the second stage examinations should be made with sufficient frequency to enable the attendant to form an accurate judgment of the rate of progress. He should also, from time to time, estimate the amount of force which is being

FIG. 60.

The expulsion of the head, the face passing over the pelvic floor. (FARABOEUF and VARNIER.)

expended, by observation of the increase of the caput succedaneum and of the tension of the abdominal walls and uterus. In addition, he should note both the maternal and fœtal heart-rate at each examination. If progress is normal the patient must be urged to keep up or increase her voluntary efforts, and encouraged with the hope of speedy relief and by the assurance of constant advance; but if after one or two hours progress is unsatisfactory, though the case may still be normal, the question as to whether an obstacle exists to explain the delay should be given consideration, as described under delayed labor.

If, on the other hand, the adaptation between mother and child is easy, if the pains are powerful, and in the judgment of the attendant there is more danger of undue precipitation and of laceration of the soft parts than of delayed labor, she should be instructed to avoid

effort, and taught to open the mouth and draw the breath in short, quick gasps like a panting dog during the continuance of each pain, this rapid action of the chest preventing the use of the accessory muscles.

If, even with these measures too rapid progress still threatens, the administration of ether to the point at which the contractions are lessened by the anæsthesia is always proper and advisable.

PRESERVATION OF THE PERINEUM. When the head begins to press against the pelvic floor and the perineum is seen to bulge outward during the acme of each pain, the stage of expulsion is at hand, and with that begins the most important function of the physician during normal labor—*i. e.*, the preservation of the perineum. The percentage of cases in which extensive laceration of the perineum necessarily occurs is very variously estimated, and must always depend not only upon the method employed, but on the skill of the

FIG. 61.

Birth of the head. (FARABOEUF and VARNIER.)

individual accoucheur; but in primiparæ at least a thorough examination will always almost reveal some solution of continuity. The various forms of technique which have been and still are employed by one or another school of obstetricians are too numerous to mention, but any method to be successful must combine certain prerequisites. It must avoid direct compression of the perineum between the presenting part and the hand of the accoucheur or any other substance. It must make it possible to absolutely check the advance of the head at any moment. Finally, it must be possible for the attendant to guide the movements of the presenting part in that direction which is at a given moment likely to decrease the tension on the mother's soft parts in the highest degree.

It must be remembered that abrupt movements of descent, even though of small extent, are far more likely to produce laceration than marked but gradual progress, and that the change of direction which accompanies the stage of expulsion is affected by the resistance of the

muscular layers of the pelvic floor, so that laceration of these tissues is, in effect, a failure on their part to possess the degree of strength requisite for the proper performance of their functions, and is to be prevented by the reinforcement of their efforts by the added power of the obstetrician's hand, as it urges the head forward against the pubic arch.

Even though we eliminate the many methods which are becoming obsolete, and which are considered improper at the present day, so

FIG. 62.

Regulating birth of head. (JEWETT.)

many excellent plans remain that all that can be admitted here is a description of those which have proved most successful in the authors' personal experience.

Position of the Patient. It should be premised that the proper preservation of the perineum invariably involves a certain amount of exposure of the patient's person, and that while it is the duty of the

attendant to avoid all unnecessary denudation of his patient, it is distinctly necessary to lay aside the mock modesty which prohibits such exposure as is essential to the proper performance of his duty. Upon the Continent of Europe it is customary to deliver women in the dorsal decubitus; but this method, however excellent if the delivery is effected on a special obstetrical chair, or with the patient in the lithotomy position, with an assistant to hold each leg, has many disadvantages when the patient is confined upon an ordinary bed.

Delivery on the Side. In this country and in England the majority of physicians prefer the left lateral position, with the thighs well flexed and the upper knee supported by a pillow. If the patient is delivered in this position, the buttocks should be brought to the edge of the bed, and the shoulders placed far enough from it to allow the attendant to sit upon the bed opposite the position of the lumbar region. His coat should be removed and his shirt sleeves rolled up to the shoulders. The hands and arms having been thoroughly disinfected, the left arm should be passed over the patient's abdomen and between the thighs, so that the finger-tips, and later the palm of the hand, may be placed against the vertex in a position to arrest the movement of expulsion. The edge of the fourchette is then constantly under the eye of the physician, a point of the utmost importance. The right hand is at liberty to wipe the mucus from the head and vulva; to test the condition of the perineum by insertion of the finger between the head and the vaginal outlet; and finally, as the head crowns, to prevent extension and a consequent undue strain on the perineum by pressure on the forehead through its tissues. This pressure is to be made not upon the centre of the perineum, where laceration is liable to occur, but on the lateral portions, which are thicker and less likely to be torn. As the edge of the great fontanelle appears at the fourchette, the right hand is able to prevent recession of the head and to urge it forward, or, as it is commonly termed, "shell the head out," by applying pressure to the face in the direction of the vaginal outlet—*i. e.*, directly forward, through the tissues immediately below and in front of the tip of the coccyx.

Another Method. The great advantage of the method just described is that it offers an opportunity of fixing the patient's position, and makes it difficult for her to move away from the attendant during the great pain of expulsion. Its disadvantage is the fact that the left hand, upon which the strain of resisting the expulsive efforts is placed, works in a disadvantageous position, so that unless the muscular development of the physician is distinctly greater than that of his patient he may find his physical strength unequal to the task. When this is the case, or when the patient is so far anæsthetized that voluntary movements of her body are unlikely, she should be placed in the same position, but the attendant should seat himself in a chair facing the vulva. The palmar surface of his right hand should

then be placed directly against the emerging occiput, in which position the whole force of the arm and shoulder can be exerted in direct opposition to its advance, while the left hand may be used to steady the patient by grasping the upper part of the thigh and the iliac crest. Since the left hand will, however, be needed in the later stages for the control of extension and for forward pressure upon the forehead through the tissues about the anus, it is better, if the patient is not anæsthetized and is uncontrollable, to direct the nurse to place herself upon the bed in such a position that she is able to prevent the patient from moving away from the physician.

Rectal Expression of the Head. In cases where the natural efforts fail to completely overcome the resistance of the perineum, the release of the head may often be affected by inserting the first and second fingers of the left hand into the rectum, and with them exerting pressure on the frontal end of the head. This manœuvre is seldom successful until the head has so far descended that the rectal fingers are able to seize the upper jaw. In this latter position a living child almost invariably begins to suck the fingers which it feels within its mouth, and is liable to draw in and swallow more mucus and liquor amnii than is desirable. For this reason the fingers should be shifted as soon as possible so as to grasp the chin instead of the upper jaw. When this grasp has once been affected the head is so thoroughly within the control of the hands, and its motions of advance or recession can be regulated with such complete facility that, when laceration seems probable it is distinctly advisable to administer ether in obstetrical degree, and to increase the amount at such a rate as the head advances that when the rectal fingers gain control of the head, the ether can be pushed to full surgical anæsthesia in a few moments, during which the head can be held immovable. All the forces of expulsion and resistance are then under the control of the accoucheur, and he possesses facilities for the avoidance of laceration which can be obtained in no other way. The advantages of such etherization are always so great that it is distinctly the method of choice.

Avoidance of Haste. No matter what method is employed it may be laid down as an axiom that sufficient caution and slowness in delivery of the head will always prevent an extensive laceration of the perineum. To this, however, the very necessary corollary must be added that this statement is only theoretically true, and in practice the golden mean between unnecessary delay, with its increase of suffering to the mother and of danger to the baby, and the undue haste which results in laceration, is not easy to determine, and that the most skilled obstetrician will inevitably fail to save the perineum in some cases. It is worth remembering that the majority of lacerations are due to the production of a slight nick during the early part of the stage of expulsion, which may be converted during the disten-

tion of the orifice by the emerging head into an extensive laceration, and that it is of the utmost importance to watch and superintend each movement of the presenting part from the time it first rests against the perineum. An unduly long perineal stage distinctly increases the risk to the child; but although the life of the child is of far more importance than the integrity of the maternal soft parts, it is a fact, that in reality comparatively few children are lost during the process of expulsion, and it is probably better practice for the young obstetrician to pay attention to the mother's tissues than to the chances of the fœtus, as it is far more probable that he will fall into the error of undue haste rather than that of undue delay.

During the whole process of delivery the fourchette should be carefully watched and the head should be allowed to descend slowly and gradually with each pain until the tension on the fourchette produces a narrow white line along its edge by compression of its capillaries. The moment the least indication of this condition is observed all progress should be arrested during the continuance of that pain and until the head recedes in the succeeding interval. This process of alternate advance and recession, and of watchfulness against undue tension on the perineum should be continued until the edge of the anterior fontanelle appears in sight. The head should then be restrained from recession by pressure over its frontal end, should be allowed to advance until the white line of pressure appears at the fourchette, and then held immovable until the gradual distention of the tissues effects its disappearance. An advance of from one-eighth to one-fourth of an inch will then usually cause its re-appearance, and all progress should again be stopped during its continuance. This process of careful, gradual, and guarded advance should be continued until the fourchette is seen to slip over the prominence of the forehead and retract across the face, at which time the majority of lacerations occur, and as it approaches, the watchfulness of the attendant should be redoubled. When the retraction of the fourchette begins the hand which covers the occiput should rotate it slightly to the side to which it was originally directed, in order to remove the projecting nose and chin from the median line, where the danger of laceration is greatest. At the same time the hand which governs the frontal end of the head should push the whole head vigorously forward, in order to promote its expulsion and lessen the tension of the tissues.

After the chin has swept over the perineum and the delivery of the head is completed, there ensues in the majority of cases a short period of uterine inertia, during which the obstetrician should wipe the vaginal mucus from the eyes of the child before they are opened, if possible; should insert his little finger into the child's mouth, and sweep out of the throat any mucus which has been inspired. After this a finger should be passed rapidly along the neck of the child and across its shoulders in search of the cord, which, in quite a large

proportion of cases, is looped in one or more turns around the neck and shoulders. If the cord is found in this situation the looser of the loops should be withdrawn from the vulva and pulled downward over the child's occiput or pushed back over its shoulders, if this seems to be more easy. It may occasionally happen that the cord is so tightly twisted that the performance of either of these manœuvres is impossible. In this case it should be cut with scissors between a double ligature, but this proceeding should not be resorted to until several efforts to release the cord have proved unsuccessful, and the necessity for its performance is to be classed among the possibilities rather than among the probabilities. During this procedure, however, the attendant must hold himself in readiness to check a too rapid advance of the shoulders if the contractions begin again, as it is probably a fact that more perinea are torn by the shoulders than by

FIG. 63.

Right shoulder engaging beneath pubes. (FARABOEUF and VARNIER.)

the head, or at any rate that a slight nick caused by the head is apt to become a serious laceration during a careless delivery of the shoulders.

DELIVERY OF THE BODY. If the cord is not about the neck, or after it has been freed, the finger should be passed across the chest of the child in search of the perineal hand, for if the arms of the child are flexed across the chest in the normal manner one or the other hand is usually within reach of the fingers. If both hands are accessible that which is attached to the perineal arm should be selected. If either hand can be drawn down by traction upon its wrist until the forearm and elbow sweep across the fourchette, the release of the corresponding shoulder is at once effected, and the remainder of the trunk can always be extracted without further difficulty. The advantage of this manœuvre lies in the fact that the bulky shoulders pass the perineum piece by piece instead of all at

once, and the strain on the perineum is greatly lessened. If neither hand is within reach, and if the shoulders do not start under the influence of the natural forces within a few minutes after the birth of the head, the right hand should seize the head in such a manner that the neck lies between the second and third fingers, which grasp respectively the occiput and the chin.

Traction should then be made forward and upward in the curve of Carus, while the left hand, applied at the anal region, urges the perineal shoulder forward. If this effort does not succeed, its failure is probably due to the arrest of the anterior shoulder behind the pubic arch. In this case traction should be made backward until the posterior surface of the neck puts the perineum slightly on the stretch, when the addition of a very slight downward pull will usually serve to

FIG. 64.

Aiding the delivery of the shoulders by raising the head. (FARABOEUF and VARNIER.)

release the anterior shoulder. After this a return to the upward and forward direction, but always without intermission of the traction, will invariably effect the delivery.

During the backward traction the perineum is in no danger, but during the forward pull it must be kept under most careful watch of the eye and hand. After the extraction of the shoulders the head and body should be swept upward over the mother's abdomen in the curve of Carus, while the left hand guards the perineum against pressure from the hips and heels, for while a perfectly intact perineum can scarcely be torn by the hips or feet, it is possible for them to convert a nick into a serious laceration.

During the extraction of the child, and from the moment the head emerges from the vulva, the hands of the nurse should be applied

to the fundus of the uterus, and should follow it down during its retraction, but without applying any force unless the physician so commands.

The hands should be retained in position on the fundus in readiness to prevent relaxation of the uterus by friction of the fundus from this time until the patient is adjudged to have passed beyond the danger of post-partum hemorrhage and is ready for the binder.

If these precautions be carefully carried out the loss of enough blood to affect the pulse, unless from lacerated vessels, is a very rare accident.

The hand having once grasped the fundus should not be removed for any reason, and it is to be borne in mind that inability to feel the uterus during a period of relaxation is of no importance if the hand is retained stationary in the position in which the uterus has been felt, as a recurrence of the uterine contraction will show the uterus to be still in the hollow of the hand. If, on the other hand, the hand

FIG. 65.

Ligature of the cord.

is removed from the fundus during relaxation, and an effort made to search for the uterus in the mistaken idea that the uterus has slipped from the grasp, an excellent opportunity is given for the relaxed organ to fill up with blood, and this may be the starting point for a severe hemorrhage. It must not be forgotten, however, that the function of the hand is rather to stimulate the uterus to contraction than to control its size by pressure.

LIGATURE OF THE CORD. After the delivery of the child its fauces should be again cleared of mucus, and unless there is cause for hurry the physician should wait until the pulsations in the cord cease before tying it, since it has been shown that infants suffer greater initial loss of weight in instances where the cord is tied as soon as the child is delivered, than when it is tied after the pulsations have entirely ceased and the baby has received all the blood from the placental circulation which naturally belongs to it. When pulsation ceases a ligature or bit of narrow bobbin should be tied tightly

around the cord at a point about two inches from the umbilicus in a square knot to prevent slipping. In tying the knot care should be taken that the hands should rest against each other (Fig. 65), as separation of the cord from the umbilicus has been known to follow the twitching consequent upon breaking of the bobbin when the hands are being drawn forcibly apart.

When the baby has once cried well it should be wrapped up in a woollen cloth, and laid in some place where it can neither fall on the floor or be stepped upon, as in a bureau drawer (or given to the grandmother), while the attention of the attendant is directed to the mother.

Third Stage. The expulsion of the child is usually followed by a period of uterine inertia, lasting from one to ten minutes. During this time the uterus should be guarded by the hand, and very gentle friction used to encourage contraction and prevent relaxation. All insertion of the fingers into the vagina should be conscientiously avoided, there being no advantage to be derived from their entrance, and its avoidance being a point of importance in the avoidance of septic infection.

Crédé's Method of Expression. The expulsion of the placenta may occur spontaneously, but in the majority of cases it is effected more rapidly and to better advantage by the use of Crédé's method of expulsion.

This procedure has fallen into disrepute with some schools of obstetricians, but it seems probable that their disapproval is largely due to bad results following neglect of the restrictions which Crédé originally laid down. Expulsion should never be attempted in the interval between uterine contractions, and the degree of force employed should never exceed a very moderate amount. It is essential that the abdominal walls should be so far depressed as to allow the fundus of the uterus to rest in the hollow of the hand, the fingers being behind it, and the thumb in front. The hand when in this position should compress the fundus at the moment when a contraction is felt, the pressure being exerted only by the palm and the base of the fingers and thumb, their tips merely steadying the uterus.

At the same moment this pressure is exerted a gentle downward impulse should be given to the uterus as a whole. In skilled hands the release of the placenta is frequently accomplished by the first effort of expression, and if the method be carefully applied, it rarely fails of success in any hands after a few repetitions.

When the placenta passes into the vagina and a sudden decrease in the bulk of the uterus is observed by the hand, it should cease to compress the fundus, and should urge the placenta onward to the vulva by a continuance of the downward pressure. As the placenta emerges it should be urged forward by pressure behind the perineum with the disengaged hand, the conversion of a nick into a laceration

being perfectly possible, even at this late stage, should this precaution be neglected. As the placenta passes the vulva it should be seized and gently twisted by the hand, but no traction should be made on it. These movements convert the fragile membranes into a tough and twisted rope which is not liable to tear, and permit their complete removal.

FIG. 66.

Manual expression of placenta. Method of Credé. (BEERS, from a photograph by H. F. J.)

ERGOT. As soon as the placenta has been delivered, but not before, it is customary to administer to the patient a drachm of the fluid extract of ergot, a proceeding which is undoubtedly unnecessary in many cases, but which, being productive of no harm, is a wise precaution in all cases, owing to its action in stimulating the uterine muscle to contraction. After the extraction of the secundines they should be examined, in order to discover any abnormalities of the

placenta or incompleteness of the membranes, which may be evidence of their partial retention in utero.

After the expulsion of the placenta the patient should be warmly covered up and allowed a few minutes' rest. The uterus should be guarded by the hand until it has remained without relaxation for at least fifteen minutes, and the pulse should be carefully watched. A slight chill is not uncommon at this time, and, although sometimes alarming to the patient, is of absolutely no importance. It is indeed said that post-partum hemorrhage never occurs when the chill has been marked.

Examination of the Perineum. At the termination of labor the physician should always examine the vagina, in view of the possibility of an internal laceration. This examination should be conducted by inserting the finger into the rectum and everting the posterior vaginal wall through the vulva, in order to facilitate the detection of any intra-vaginal tears, which are extremely common and productive of at least as great a loss of support as can be attributed to any external laceration. For this examination at least a rubber cot or glove is essential, on account of the difficulty of rendering the finger aseptic in case perineal repair has to be undertaken, in which event the cot or glove should be changed or removed.

Duties of the Physician after Labor. Bed, Binder, etc. The process of cleaning up the bed and patient after labor is properly the province of the nurse, but since the physician is not infrequently called upon to perform it in cases of premature labor, or where no nurse has been engaged, it is essential that he should be familiar with its details. The patient should not be allowed to turn on her side before the application of the binder unless the abdomen is guarded by the hand, since its relaxed walls afford the fullest possible opportunity for the entrance of air into the vagina, or even into the cavity of the uterus, in case the patient turns accidentally into Sims' position, with the consequent practical danger of septic infection, and the very theoretical one of air embolism.

The vulva and neighboring parts should be carefully washed with the antiseptic solution, and an intra-vaginal, or, if the hand has for any reason been passed into the uterus, an intra-uterine douche may be given. This serves to wash out whatever blood clot may have collected, and thus removes a field for bacterial growth if nothing else.

Any vulvar or pubic hair which has been soiled with blood or other discharges should be carefully trimmed away with scissors. The vulvar pad should be applied, and the draw-sheet and all soiled clothing should be removed, with due precautions to avoid any unnecessary exposure of the patient.

The binder should now be applied. This should be long enough to meet across the patient's abdomen and of a width sufficient to extend from below the trochanters to the lower ribs. The patient's

knees should be placed close together, the lower edge of the binder drawn as tightly as possible and secured with a large safety-pin, and the remainder of the binder should then be drawn and pinned together firmly but without excessive compression.

The ends of the vulvar pad or napkin should be fastened to the binder and the patient covered with a fresh sheet. The attendant should remain in the house for at least an hour after the birth of the child, and should not leave the patient under any circumstances until her pulse has fallen to about normal range.

Post-partum hemorrhage is extremely rare with a pulse of less than 80, and almost unknown with a pulse which is less than 60 beats per minute or which is falling rapidly.

At the conclusion of the case any instruments which have been used should be washed at once with soap and water, thoroughly dried, and returned to the bag, of course out of the hearing of the patient.

The physician's last duty before leaving the house is to make a final inspection of the patient, to take the pulse, and see that the uterus is firmly contracted.

Care of the Baby. After the mother has been carefully arranged in bed the baby should be washed and dressed, and, though this again is the duty of the nurse, it is a matter with the details of which the physician should be thoroughly conversant. A woollen cloth should be laid across the lap and used to cover the baby as thoroughly as possible during the process of washing. The vernix caseosa should be thoroughly softened with warm olive oil, especial care being taken to expose completely the deep wrinkles about the neck, groin, and other joints of a well-nourished baby. The whole surface should then be rapidly and thoroughly, though gently, washed with a soft sponge with pure castile soap and water at a temperature of from 90° F. to 95° F.

The dressing of the cord immediately after delivery is considered by many patients as part of the physician's duty, and at any rate he should re-examine it before the child is clothed, in order to make certain that the ligature is sufficiently tight. The cord and the neighboring skin should be carefully washed with an antiseptic solution, carefully dried, and enveloped in absorbent cotton or soft, dry linen which has been sterilized. If the cloth dressing is used, a hole should be cut in the middle of the square piece of old linen and the cord should be passed through the hole until the cloth rests against the skin, when it should be wrapped securely around the cord and held in place by the belly-band. The popular practice of browning the cloth in the oven is, perhaps, to be recommended as an attempt at sterilization.

If the cord is dressed aseptically and no moisture is subsequently allowed to approach it, it rapidly dries up into a hard, shrivelled

body, which separates in from five to ten days and leaves a dry and thoroughly healed surface behind it.

The clothes provided for the baby vary greatly with the social status of the parents, but although the children of wealthy parents are often provided with extra garments, the various forms of dress are all based upon the same general plan.

The following list comprises all the necessary articles :

They should be put on the child in the order in which they are described. The first article to be adjusted is the belly-band, which should be a strip of flannel, wide enough to extend from the pubes to the axillæ, and long enough to be wrapped twice around the baby. It should be wound snugly, not tightly, around the whole body, and secured in position by four small safety-pins. After the first ten days this flannel band may preferably be replaced by a cylindrical knitted or woven band, not unlike a section of the leg of a thick stocking.

This possesses the advantages of rendering unduly tight pinning, with consequent compression of the chest impossible, and of dispensing with the use of pins.

The binder being adjusted, the next garment which should be put on is a short undershirt. This is often made of cotton, but it is better that it should be woven, and similar to the undershirts of adults in all respects, except that it should button down the whole front, rather than be so made as to be drawn on over the shoulders.

The shirt is followed by a garment known as the pinning blanket, which, as ordinarily made, consists of a large piece of flannel slightly gathered at one end and attached to a strip of cotton. If this form of pinner has been provided, the cotton strip should be wrapped around the chest and secured by safety-pins.

The flannel skirt will then be wrapped several times around the limbs and will extend far below them. Its end should be turned over and pinned to itself by a large safety-pin about opposite the child's knees. This garment may better, however, be replaced by one made up wholly of flannel, and in winter furnished with sleeves, which buttons up the back, and is attached to a long skirt which is not slit up as is the old-fashioned pinner.

Before the bottom of the pinning blanket or its substitute is turned up and fastened, the diaper should be adjusted. This is a large napkin which must be folded into a triangular shape, and placed under the sacrum of the child, with its long side uppermost.

It is then folded around the body so that the upper corners meet in front of the pubes ; the third corner is then brought up between the thighs, and the three are fastened together with a large safety-pin. The shirt is frequently furnished with a small flap attached to its bottom in the median line in front, and if this is found it should be included in the pin which holds the diaper.

One or more cotton or linen dresses, furnished with long skirts and buttoned up the back, are then put on, a light shawl is folded over the shoulders, and the child is dressed. Small knitted socks are often provided, but their use is not to be recommended, since if the pinning blanket is properly adjusted they are entirely unnecessary, and because they can be prevented from falling off only by a band around the ankle which nurses are apt to tie so tightly as to interfere with the circulation in the feet.

The physician should never forget to examine the child thoroughly for possible abnormalities immediately after delivery, as it is extremely humiliating for him to have his attention called to such a deformity by the family after he has assured them that the child is perfect. He should count the fingers and toes, should insert his finger into the mouth in search of a cleft palate, and into the rectum to make sure that the anus is patent, and should run his eye over the whole surface of the skin for birthmarks, as these are the only abnormalities which might otherwise escape his notice.

CHAPTER XII.

DELAYED LABOR.

GENERAL PRINCIPLES OF THE MANAGEMENT OF DIFFICULT OR DELAYED LABOR IN THE ANTERIOR POSITIONS OF VERTEX PRESENTATIONS.

THE prominence which is necessarily given in the study of obstetrics to the management of malpresentations and abnormalities is apt to obscure to the mind of the beginner the fact that the majority of obstetrical operations are performed for the relief of delayed labor in head presentations. Important as it is that any physician who proposes to engage in the practice of obstetrics should be equipped with a thorough knowledge of the abnormalities he is likely to meet, the first essential in the management of difficult cases is a thorough comprehension of the conditions which indicate interference in any case.

The management of abnormal cases, though complicated by the additional indications furnished by the pathological condition present, rests primarily on the same general principles as the management of delayed labor. Success in the management of abnormalities is, moreover, essentially dependent upon a clear comprehension of the general indications for operation which are common both to abnormal conditions and to delayed normal labor. It is, therefore, proper that the subject of delayed labor in anterior positions of the vertex should immediately succeed that of normal labor under similar conditions. This is especially true, since the maintenance of an attitude of watchfulness for the occurrence of delay or arrest is, perhaps, the most important of the physician's duties during labor.

When labor progresses rapidly and normally the duties of the attendant are limited to encouraging and cheering the patient, the relief of pain, the preservation of the perineum, the expression of the placenta, the prevention of post-partum hemorrhage, and a supervision of the subsequent arrangements for the patient's comfort.

If it could ever be known in advance that the progress of labor in a given case would be entirely normal and satisfactory, this would be the whole duty of the obstetrician, but since such knowledge is unattainable and the most promising of cases may at any time turn out badly, as the result of non-observation or neglect of some trifling abnormality, a far more important duty than any of these is always

incumbent on the accoucheur. His most serious obligation in the care of labor is the maintenance of an attitude of watchful supervision which will enable him to detect and control the slightest deviations from the normal standard. In other words, prophylaxis is by far the most important duty of the obstetrician.

Two classes of complications may arise in any case: First, those which belong to the mechanical or organic pathology of labor; and, second, the disturbances of function resulting from a want of power on the part of the mother, or a disproportion between the size of the child and the maternal passages in otherwise normal labors. The latter class of cases are commonly grouped together under the head of difficult or delayed labor, and comprise the subjects which immediately interest us, while the description of the various malpresentations and other pathological conditions must be postponed for separate consideration.

Normal Labor.

It must be remembered that both the forces of expulsion and the resistance to be overcome vary widely and independently of each other, and that arrest in progress may be due either to the presence of an over-firm resistance in opposition to normal expulsive forces, or to feebleness of expulsive efforts in the presence of no more than normal resistance. Normal labor may then be said to occur only when the contractions of the given uterus are sufficiently strong to deliver the individual head. In any case the probability of an ultimate delivery by the forces of nature before exhaustion sets in must be decided by balancing the amount of work already done and the degree of exhaustion present against the amount of progress which is necessary before delivery can occur.

Delayed Labor.

Delayed labor may be defined as occurring whenever, at any stage of the process of parturition, a considerable period elapses without satisfactory progress, or when the signs of exhaustion of mother or child appear. The amount of time which must be wasted to constitute delay and cause exhaustion varies widely with the strength of the individual patient and the stage of labor at which it occurs, but the skilled obstetrician should be able to anticipate delay by observing earlier that the amount of progress which is being made is disproportionate to the vital force which the patient is expending.

During the first stage and in the presence of slight and infrequent but regular pains, many hours may pass without any considerable increase in dilatation or producing any ill-results, while in other cases a few hours of first-stage pain may produce considerable exhaustion.

Whenever, then, in any stage of labor the rate of progress, which has previously been good, begins to fall off, it is the duty of the

attendant to keep a constant and close watch of the condition of the mother and child, in order to detect the first signs of approaching exhaustion in either patient.

In the second stage of labor the entire arrest of previously good progress for even a single hour is highly suggestive of the presence of exhaustion of the uterus or of some efficient mechanical bar to progress.

Exhaustion of the Fœtus. The condition of the fœtus can be ascertained only by auscultation of its heart sounds, but these fortunately furnish an extremely reliable guide. Under normal circumstances its heart-beats become slightly more rapid during each contraction of the uterus, and for this reason the physician's observation of them should be limited to the intervals between pains.

When repeated examinations demonstrate the fact that the fœtal pulse is steadily rising, it may fairly be presumed that the child's hold on life is becoming precarious. If this indication for interference in the interests of the child is neglected and the case is left to nature, other changes in the rhythm of the heart's action occur which show that the child is steadily losing ground, and that interference in its behalf is imperative. As the child grows weaker the increase in the rapidity of its heart is shortly followed by a marked slowing of its rate, and this in turn by the development of intermittency.

Another sign which denotes failure of the child's strength, and which may appear before the heart has begun to fail, is the appearance of meconium in the liquor amnii, which drains away during the intervals between the contractions. Of course, in breech presentations this sign possesses no significance, but with a head presenting it indicates beginning failure of the fœtal powers with relaxation of the sphincters, and calls for redoubled watchfulness of the fœtal heart.

Exhaustion of the Mother. The first indication of the failure of the mother's strengtn is furnished by a steady increase in the rapidity of her pulse at each successive examination. The appearance of any irregularity in the rhythm of the uterine contractions is also an indication of importance, and is a sign that the uterus itself is becoming exhausted. A state of despondency, irritability, or nervous excitement is also a factor which must be taken into consideration in estimating the maternal condition.

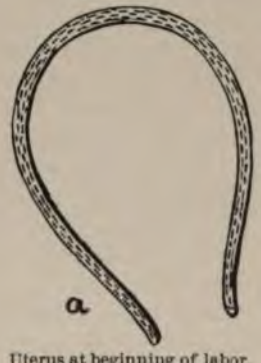
Uterine Exhaustion. Annular Constrictions. Retraction Rings. General Retraction.

If labor is allowed to persist for any great length of time after the general powers of the mother begin to fail, it is almost certain to result in the production of a tonic annular spasm of the uterus (a constriction ring), which practically puts an end to all hope of relief by the natural powers. This may also be the result of some faulty innervation of the uterus, and appear early in labor before the rupture

of the membranes. Long-continued and ineffective labor in opposition to an efficient obstacle also necessarily results in the end in the production of a tonic rigidity of the uterus from premature retraction of its walls and the formation of Bandl's retraction ring. After the complete escape of the waters these two conditions may be combined in general retraction of the whole uterus—*i. e.*, the close application of its whole surface to the surface of the child.

The existence of any one of these conditions is an absolute indication for an immediate operative delivery; and since the presence of any one of them greatly increases both the dangers and difficulties of any operation which may be proposed, it is a matter of the first importance that the obstetrician should be able to recognize early the approach of uterine rigidity, and should thus be able to terminate the labor before rigidity becomes a well-established fact.

FIG. 67.



Uterus at beginning of labor.

FIG. 68.

Retracted uterus after labor.

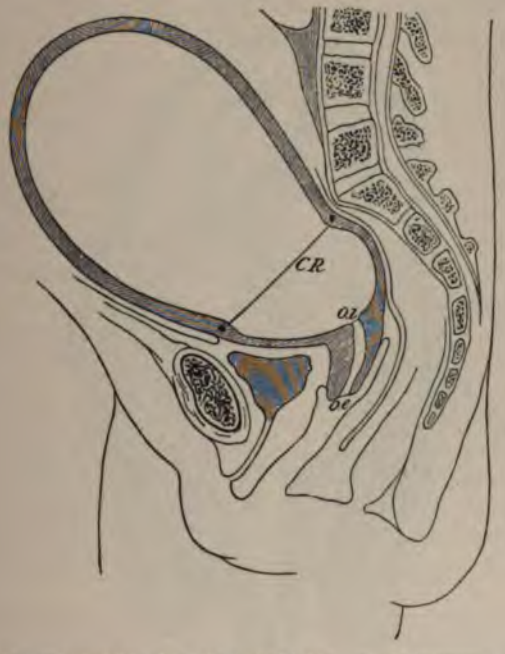
Constriction Rings. On the other hand, the spasmodic "hour-glass" constriction ring of an irritable and irregularly contracted uterus (Fig. 69), though it may occur, as is sometimes seen, in a uterus with unruptured membranes, is most often found only after a more or less complete escape of the waters. It is the result of an irritable rather than of an exhausted condition of the uterine muscle, and, although it is most common after the uterine muscle has become tired, may occur at a very early stage of labor. It is due to the action of the circular fibres alone, and is most common around the neck of the child, though it may occur in any horizontal zone of the uterus.

The most characteristic clinical sign of the occurrence of a constriction ring is the development of a state of tonic contraction of the uterus, preceded and accompanied by irregularity of the pains.

Bandl's Ring. In normal labor the descent of the child, and the consequent decrease in the size of the uterine contents, is compensated for by a process known as retraction, which consists in a re-arrange-

ment of the muscular fibres of the uterus, which results in a decrease in area and an increase in thickness of the uterine wall. Throughout labor each contraction is properly followed by a slight amount of retraction of the uterus as a whole; when prolonged and abnormal labor is not compensated for by the descent of the child, on account of the existence of an arrest of progress, this process of retraction results in an abnormal tension of the uterine wall as a whole. The uterine muscle is made up of two sets of fibres, one longitudinal and the other horizontal or circular, both of which take part in the

FIG. 69.



CR. Contraction ring, or retraction ring, at onset of labor. *oi.* Os internum. *oe.* Os externum. (SCHROEDER.)

process of retraction, and the complications which may arise vary as one or the other of these sets of fibres is the more active in producing them.

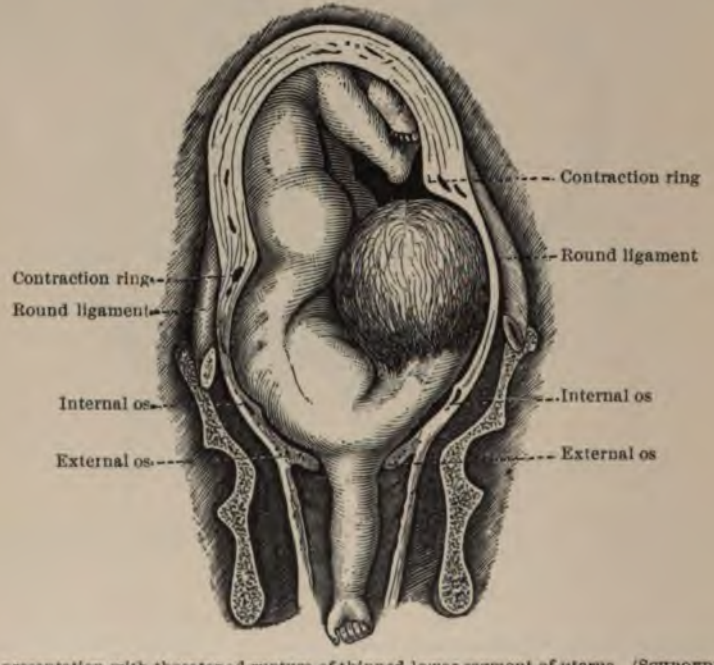
The true retraction ring of Bandl (Fig. 70), whether we believe it is situated at the level of the internal os or above it, is, at all events, always due to passive distention and thinning of the less powerful lower segment of the uterus, by the active contractions and retraction of the more powerful upper part. It is frequently developed in the presence of a normal or excessive amount of liquor amnii, and when seen in a pure state is due entirely to the action of the longitudinal

and not at all to that of the circular fibres. It is felt clinically as a mere ridge in the uterine wall, is in no sense a constriction ring, and, like the general retraction of a dry uterus, it is the necessary result of exhaustion of the uterine muscle by a too long continuance of labor in the face of an obstacle.

The most characteristic clinical sign of the appearance of Bandl's ring is the persistence of a tonic contraction of the uterus in the intervals between the pains without any alteration of their rhythm.

General Retraction. The general retraction of a dry uterus upon the child leads to a condition in which the uterine wall is rigidly

FIG. 70.



Arm presentation with threatened rupture of thinned lower segment of uterus. (SCHROEDER.)

applied to the surface of the child throughout the whole or the greater part of its extent.

It is well understood as being the inevitable result of a too early escape of the waters, followed by prolonged and powerful labor in the face of an efficient obstacle.

It is universally admitted, both from the increased difficulties and dangers of any operation in such cases, and because of the impediment which is offered to the placental circulation, that labor occurring in a dry uterus should be watched more closely and subjected to operative interference more early than when a normal amount of

liquor amnii is retained. If general retraction is present in a marked degree it is almost always complicated by the co-existence of the contraction ring of Bandl, and in any degree is usually accompanied or preceded, especially in head presentations, by one or several more or less localized circular constrictions or constriction rings.

DIAGNOSIS. The first warning of the approach of any of these conditions is to be found in the behavior of the pains. Whenever pains which have been regular, strong, and intermittent for some hours begin to decrease in force and to become tonic and unintermittent, the existence of one or the other form of retraction should be feared.

Whenever strong and regular pains begin to be uncertain and irregular—*i.e.*, when they begin to vary greatly in strength and duration and to occur at irregular intervals, a suspicion of the formation of a constriction ring should be excited.

When the existence of either of these conditions is suspected, the patient should be subjected to a thorough examination, both abdominal and vaginal, and under ether if necessary.

If the general retraction of a dry uterus be present, the close application of the uterine wall to the outlines of the child, and its rigid condition, may usually be appreciated by abdominal palpation.

Bandl's ring can sometimes be felt through the abdominal wall as a linear increase in the thickness of the uterine wall lying above, and parallel to the brim of the pelvis. It may always be detected by inserting the half hand into the vagina, and cautiously passing a finger between the head and pubes along the anterior uterine wall. The ring is then felt as a transverse ridge in the wall of the uterus.

A constriction ring may exceptionally be discovered by a careful abdominal examination, especially if the examination is made on account of suspicion of this condition. If the ring be situated about the child's neck, it may be felt by a digital intra-uterine examination, made by passing the hand into the vagina and the fingers into the uterus.

This examination is in effect, however, an operation in itself, and as a preliminary, the patient should always be etherized to the point of surgical anæsthesia, in order to secure the greatest possible relaxation of the uterus. The examination should be made only in the intervals between any pains which may persist, and the utmost care should be taken to apply firm counter-pressure over the fundus during the examination. That any or all of these conditions may occur after prolonged labor, even in the presence of an undilated os, is a fact which must not be overlooked.

Management of Delayed Labor.

The conditions which lead to success in the management of difficult labor are the attainment of an early and accurate diagnosis of the

mechanical relations in the given case and a correct appreciation of the indications for operation which the case presents at the time when the question first arises.

It is the first axiom of midwifery that the natural forces, when at their best, are preferable to the best efforts of the obstetrician.

Unfortunately, nature is not always efficient, and there can be no doubt that when nature absolutely fails in the task before her, her place must be supplied by art. Modern obstetrics, however, aims at more than this. Armed with our present knowledge, we ought to be able to foresee impending evil, to realize in advance that nature is likely to fail in a given case, and to forestall undue exhaustion by an artificial termination of the process which is about to produce it.

It may be said, then, that interference becomes justifiable whenever labor has been protracted to a point beyond which its further continuance is thought to expose either mother or child to greater risks than are involved in operative delivery.

It is evident, however, that this ratio between the risks of delay and interference must depend not only upon the severity of the proposed operation, but upon the skill of the individual operator as well; for it is plain that in a given case the risks of delay may be at the same time greater than those of an operative delivery in skilful hands, and less than those of the same procedure, if performed in a bungling manner. The young obstetrician whose skill is yet to be acquired will then act most wisely if he adopt the more conservative methods, and may properly avoid an operation in some cases in which a more experienced operator would interfere.

He must at first endure the tedium of protracted labor until distinct evidence of approaching exhaustion of the patient is forced upon his observation.

If, however, it is certain that a given operation will eventually become necessary, it is far better that it should be undertaken even by an unexperienced operator before the strength of the mother has become exhausted by protracted, unavailing efforts, and before the vitality of the child has been lowered by an unduly long exposure to the pressure of the contracting uterus. The beginner must, however, be cautioned to be sure of his premises before applying this principle.

Exhaustion as an Indication for Operation.

When the signs of any of the three forms of exhaustion appear—*i. e.*, of mother, of child, or of uterus, the necessity for operative interference is to be estimated by comparing the degree of exhaustion present with the amount of work which still remains to be done, and the extent to which progress is already failing. On these facts an opinion must be formed as to the probability of the occurrence of delivery by the natural forces before more serious exhaustion occurs.

It is evident that when an appreciable degree of exhaustion makes its appearance early in labor, at a time when the bulk of the work still remains to be done, its significance as an indication for operative interference is much greater than that of a more marked exhaustion occurring at a late stage of labor, when even the somewhat exhausted maternal powers may enable the patient to endure the small amount of exertion which is still necessary, without harmful results. The failure of progress is to be estimated by observing the rate of dilatation of the os, or in the second stage the descent of the head, by frequently repeated vaginal examinations; and by the increasing size and firmness of the caput succedaneum if present, which, created as it is by purely mechanical causes, furnishes the most reliable information obtainable in regard to the amount of force which has been expended to accomplish the progress that has already been made. It may be said in general that the presence of a large and increasing caput in combination with lack of progress is almost infallible evidence that operative interference will sooner or later become necessary, and is always an indication for a careful search for some insuperable mechanical obstacle to the delivery of the child which demands recourse to the obstetrical art.

Delayed First Stage.

It was long held as one of the first rules of midwifery that no danger need be apprehended to either mother or child from undue prolongation of the first stage. In point of fact, however, nothing in obstetrics presents more serious difficulties than the management of protracted first stages. Many of the most serious of the obstructive difficulties of labor are habitually marked by an apparent prolongation of the first stage, due to the fact that in such cases the head, after the rupture of the membranes, is unable to exercise any effective pressure against the os. Should the membranes in such a case rupture early, the os necessarily fails to dilate, and even if their rupture is delayed, the absence of any pressure against the cervix and the compression of the lower segment of the uterus between the head and the pelvic brim usually result in the production of a spasmodic contraction of the os, which is extremely likely to be mistaken for that rare condition, a simple rigidity of its tissues.

Delay in the first stage of labor is evidenced by the absence of progress in the dilatation of the os. This may be due to the weakness of the contractions—*i. e.*, to uterine inertia; to a pathological rigidity of the tissues of the cervix; or, if the membranes have ruptured, to the existence of some mechanical obstruction which prevents the dilating wedge of the head from exerting effective pressure against the os.

Inertia Uteri. The state of inertia, or simple uterine atony, is most frequently seen in women who have borne many children in

rapid succession. It may be primary and due to a defective development of muscular fibres in the uterine wall, or it may follow some hours of good labor, and then is, in effect, a period of rest for the over-tired muscles. In either case it is usually succeeded, after a longer or shorter interval, by a period of renewed uterine activity, which in most cases results in a prompt termination of the labor. The appearance of comparative inertia after a period of good labor is always highly suggestive of the supervention of uterine rigidity, although this is not the necessary sequence of events. The two conditions are to be differentiated by the existence in inertia of complete relaxation between the pains.

Rigidity of the Os. When delay in dilatation occurs in the presence of good pains it may be due either to a rigidity of the tissues of the cervix which is sufficient to afford an abnormal degree of resistance to the efforts of the uterine muscle, or to the fact that the mechanical relations are such that the dilating wedge fails to exert a sufficient amount of pressure against the os.

A pathological rigidity of the tissues of the cervix does without doubt sometimes exist, but it is extremely rare. It is to be differentiated from a spasm of the cervix; from the existence of adhesions between the membranes and cervix; from deficient pouching of the membranes; and from failure of the head to exert pressure against the os after the rupture of the membranes.

Diagnosis of the Cause of Delay.

The diagnosis between pathological rigidity of the cervix and the other conditions which may cause delay in the dilatation of the os can only be made by a high examination under full surgical anæsthesia. Cervical rigidity is to be differentiated from spasm of the cervix by the fact that in the former condition the uterine tension persists when the patient is fully anæsthetized. The existence of adhesions between the cervix and membranes is to be ruled out by the fact that the adhesions are not found when the examining finger is swept around the circumference of the cervix in search of them. Deficient pouching of the membranes is to be excluded by observation of how much they bulge during the pains; and the failure of the head to exert efficient pressure against the os is ascertained by examination during a contraction.

The dangers which follow the neglect of high arrest from any cause, even in cases whose pelvic measurements show no diminution, are so great that the following may be laid down as an imperative rule: When fair labor has been present for from fifteen to eighteen hours without accomplishing proper dilatation of the os, or when thoroughly good uterine contractions have been endured for from five to six hours without effecting a dilatation which corresponds to their

strength, the patient should be etherized and subjected to a digital intra-uterine examination, even though no signs of exhaustion are as yet present.

The High Examination. The patient should be anæsthetized; the half, or, if necessary, the whole hand should be inserted into the vagina; and one or two fingers passed their whole length within the os. The diagnosis of presentation and position should be fully verified, the pelvis should be measured, and the relative size of the head and pelvis should be carefully estimated by observing whether the greatest diameter of the head is markedly larger than that which already occupies the brim.

Such an examination, though distinctly an operative procedure, is attended by but slight if any risk to the mother, provided that it is conducted with the greatest gentleness and under full anæsthesia. It may not infrequently establish the diagnosis early in labor of the existence of a malpresentation or other obstacle, which at that stage may be rectified by mild measures, but which, if left untreated until after the supervention of uterine rigidity, would, perhaps, necessitate a severe operation. Further, it affords an opportunity for gentle dilatation of the cervix, by which the patient may be saved some hours of suffering.

Treatment of Delay in the First Stage.

Inertia Uteri. If delay is due to inertia it is important that the patient should be cheered and encouraged, and that her strength should be supplemented if necessary by the moderate administration of stimulants, since inertia often results in part from despondency and nervous fatigue, and disappears on the return of cheerfulness and hope of an early release from pain.

In some cases much may be effected by gentle stretching of the os with two fingers at the commencement of each pain. This is to be regarded, however, rather as a means of exciting uterine contractions, than as a manual dilatation of the os, and consequently the least possible amount of force must be employed. All unnecessary rubbing or tension upon the margin of the os is to be carefully avoided, on account of its liability to result in laceration.

Inertia is often dependent to a large extent upon the presence of a full bladder which, by its own distention and consequent traction upon the anterior uterine wall, decreases the power of the uterus to contract. This distention also exerts a still more important effect by reflex nervous influences. As a consequence of this relation the first step in the treatment of uterine inertia should invariably be the passage of the catheter and a complete evacuation of the bladder.

If the os is nearly dilated when inertia supervenes, and is so soft and elastic as to be practically dilatable, rupture of the membranes

may be followed by the production of vigorous labor. In exceptional cases inertia may resist all these measures for so long a time that signs of exhaustion may appear as a mere result of the endurance of pain and of nervous tension. In these cases it may be necessary to resort to manual dilatation and the use of high forceps for the relief of simple inertia.

Ergot in Inertia. The use of ergot as a substitute for forceps in the treatment of inertia is still so widely popular that it must not be passed over without some consideration. The physiological action of ergot is the production of a tonic contraction of the whole uterine muscle, cervical as well as corporeal. Its effect upon the expedition of labor is extremely uncertain, since in the majority of cases it produces a contraction of the cervix which is strong enough to resist the ergotine contraction of the fundus, and in such an event the tonicity of the contraction almost invariably results in the death of the fœtus by causing the arrest of the placental circulation, unless operative interference is resorted to. Although occasionally promptly successful, this happy result is so rare, and the dangers which attend its use are so much greater than those which follow the employment of forceps that the free use of ergot, while any portion of the ovum remains within the uterine cavity, is unhesitatingly condemned by most modern authorities, at least in labor at term or during the last three months of gestation. Some high authorities permit themselves to administer extremely small (10 minims) doses of the fluid extract of ergot, at intervals of twenty minutes, in cases of simple uterine inertia in which the os is practically dilated, and where they feel certain that the rapid delivery of the child is prevented by nothing but the absence of vigorous uterine contractions.

All agree, however, that its use must be followed by the maintenance of an extremely careful watch upon the fœtal heart, and that the obstetrician must hold himself in readiness to apply forceps without delay if any indication of change in the fœtal heart occurs.

Although the guarded use of ergot in this manner may, in a few selected cases, be allowable to experts, the danger of a wrong diagnosis of the cause of delay is so extremely great that the accoucheur who permits himself to employ it assumes a far greater responsibility than is involved in the application of high forceps in any case. The reckless use of this drug, which is still extremely common, is a relic of more ignorant times, and is to be unhesitatingly condemned.

Rigidity of the Cervix. Rigidity of the cervical tissues may be due to an over-activity or an over-development of their muscular elements, or to the existence of an organic alteration of their substance—*i. e.*, stenosis. If no mechanical obstacle is detected by an examination under ether, and if the rigidity of the os disappears, only to be re-established after the recovery of the patient from anæsthesia, the failure of progress is probably due to an over-activity of

the circular fibres of the cervix and a consequent undue resistance to the pressure of the dilating wedge. This condition may usually be overcome by the administration of chloral in fifteen to twenty-grain doses, repeated at intervals of twenty minutes, to a maximum of fifty grains, or by the obstetrical use of ether.

If these measures fail the application of a 10 per cent. solution of cocaine on a pledget of cotton to the cervix for a few minutes is often followed by the complete disappearance of the spasm.

If no mechanical cause for the arrest is discovered, and if the rigidity of the os does not disappear under full surgical anæsthesia, it may be admitted that an over-development of the cervix is present. This, when recognized, may usually be overcome by gentle manual dilatation of the cervix, which in these cases does not need to be carried to the degree of complete dilatation, since a very moderate stretching often produces a change of condition which permits dilatation to progress under the forces of nature.

When true organic stenosis—*e. g.*, from cicatricial tissue—exists a mechanical dilatation of the os, or even the use of the knife, may be required.

Malpresentations, etc. If a malpresentation is found it should be rectified, at once if possible, since its persistence untreated necessarily leads to the supervention of retraction or of a spasmodic rigidity of the uterus. If the delay proves to be due to a disproportion between the size of the head and the pelvis, the obstetrician should be stimulated to the closest possible observation of the progress of labor, in order to be ready to operate, if that should prove necessary, before the appearance of any serious degree of exhaustion.

In general it may be said that when the question of operation arises during the first stage, the conditions which should incline one toward a conservative policy are slight dilatation of the os, rigidity of the cervix and other soft tissues, a satisfactory condition of the pains, and the fact that fairly good, if not perfectly satisfactory, progress is still present. On the other hand, a comparative arrest of progress in the presence of a large and increasing caput, complete dilatation or dilatability of the cervix, an elastic perineum, and a rapidly increasing failure of the uterine forces are arguments in favor of immediate interference.

Delayed Second Stage.

The management of delay in the second stage of labor practically resolves itself into the question of the expediency or inexpediency of operative interference at any given minute. Since the risks of both delay and interference decrease in proportion to the amount of descent which has been effected, it is necessary at the start to divide the consideration of delay in the second stage into substages in accordance with the height of the head in the pelvis.

This is determined by the relation which the greatest diameter of the head bears to the pelvic walls—*i. e.*, according to the zone of the pelvis which is occupied by the girdle of contact between the head and the pelvic walls. When the greatest diameter is above the inlet the head is said to be free above the brim. When the greatest diameter occupies the strait itself the head is said to be engaged at the brim. When the girdle of contact occupies a position between the superior and inferior straits the head is in the excavation. When the greatest diameter is found at the inferior strait the head is low; and when it has passed the inferior strait, and the vertex distends the perineum, the head is said to be on the perineum. Although when the head is in the excavation its delivery is attended by somewhat greater risks and is more difficult than when it is on the perineum or at the inferior strait, the difference in risk to both mother and child from operation is so much more altered by the fact that it has or has not passed the brim, that it is customary to divide the question into the consideration of high and low operations, all cases in which the greatest diameter of the head has passed the superior strait being placed in the category of low operations.

In normal pelves, and with anterior positions of the vertex, delay in the second stage is, as before, due either to relative feebleness of the pains in opposition to a normal adaptation between the head and pelvis; or, on the other hand, to unduly great resistance in the presence of normal uterine forces. The increased resistance in the second class of cases may be due either, to the rigidity of the soft parts of the mother or to the undue size or firmness of the fœtal skull.

Inertia in the Second Stage. HIGH ARREST FROM INERTIA. The diagnosis of uterine inertia during the second stage of labor is to be made by the exclusion of any obstructive elements in the case on high examination under ether, and by the fact that feebleness of the contractions has existed from the start.

When delay with the head high is due to relative inertia of the uterus, the expedients recommended for the treatment of inertia in the first stage should be given a fair trial. Since, however, the dangers of interference are considerably decreased by the disappearance of the cervix, and because operations undertaken for the relief of mere inertia, in the face of no more than normal resistances are uniformly easy, it is ordinarily proper to resort to an operative delivery whenever there has been an absence of progress of from one to two hours' duration, or at the slightest indication of the failure of the powers of either mother or child.

LOW ARREST FROM INERTIA. When the uterine contractions have been sufficiently powerful to affect the descent of the head into the excavation, but then die away and are succeeded by an absence of progress at the inferior strait, the risks of the performance of a probably easy low forceps operation are so slight that it is usually proper to com-

plete the delivery by instrumental means after an hour has gone by without any increase of descent. Such action is justifiable, not only on the ground of humanity to the mother, but because it has been found by experience that, although it may result in a slightly increased number of lacerations of the perineum, it decidedly decreases the percentage of stillborn children.

HIGH ARREST FROM INCREASED RESISTANCES. When at any time after the effacement of the cervix the high head has failed to make any advance during a full hour of strong labor it is good obstetrics to pass the half hand into the vagina under ether, and thus enable one or two fingers to reach high enough to make an accurate and complete examination of the position and the relations which the head as a whole bears to the pelvis.

If such an examination demonstrates the absence of any abnormal conditions, and establishes the fact that the delay is due solely to the unusual size and firmness of the head, all thoughts of operative interference should be abandoned until indications of impending exhaustion arise in one or the other patient.

It frequently happens that a head which was at the start, to all appearances, so disproportionate to the pelvis as to afford but little reasonable hope of delivery by the unaided uterine forces, becomes so moulded during a few hours of strong labor as to pass the brim under the force of nature alone before the powers of either patient fail.

It is, moreover, a well-established fact that the moulding of prolonged labor is far better borne by the child than is the immediate and forcible reduction of the bulk of its head during a rapid instrumental extraction. Such delay is, however, always sufficient cause for anxiety, and should excite the obstetrician to the maintenance of an unusually close watch for the appearance of maternal, uterine, or fœtal exhaustion. When the fœtal heart or maternal pulse begins to rise steadily, or when previously regular and intermittent pains become irregular and tonic, it may be taken for granted that the delivery of a living child by natural labor has become improbable.

When the fœtal heart-beat permanently increases in rapidity it is important that the child should be promptly delivered, since if operation is delayed it must not improbably be eventually undertaken at a time when the vitality of the child has become distinctly impaired, and when its chances of survival are therefore much decreased.

It may be taken as an axiom in midwifery that, although the preservation of the maternal soft parts is an object of the first importance, it is always subservient to the interests of the child, and no operation for the benefit of the child should be delayed in order to lessen the risks of laceration.

When the maternal pulse is steadily rising, operation is indicated in the interests of both patients, since it is unlikely that powers which have begun to flag before the head has passed the superior strait will

be equal to the performance of the large amount of work which still remains to be done; and if an operative delivery is to be necessary it is far better that it should be performed while both patients are in comparatively good condition. Moreover, when the general strength of the mother has once failed it is highly improbable that the uterus will long remain in a normal condition. As a matter of clinical experience, an increase in the maternal pulse is almost invariably followed, after a short interval, by the appearance of the irregularity or tonicity of the uterine contractions, which is diagnostic of the appearance of premature retraction of the uterus.

The exhaustion of the uterus, which is shown by the appearance of tonicity, is sufficient evidence that the powers of the given uterus will be insufficient for the completion of labor.

Choice Between Forceps and Version in High Arrest from Increased Resistances. Until a comparatively recent date the question as to whether version or forceps were the preferable operation admitted of serious discussion. At the present time that question can only be answered in one way. Among skilled operators the use of forceps is preferred in almost every case to the performance of version, since a skilfully performed forceps extraction is less dangerous to both mother and child than is an equally well-performed version. Version is unquestionably the more powerful operation of the two, and is reserved in skilled hands for those cases in which it is impossible to make a satisfactory application of the forceps—those in which the force of the forceps proves inadequate to overcome the resistance which is encountered, or those in which the presence of some emergency—*e. g.*, placenta prævia—calls for the most rapid method of delivery possible.

For the unskilled operator version is probably a safer operation in cases of high arrest—at least for the child—than a forceps extraction performed in a bungling manner; but in trained hands the use of forceps is to be preferred, with the exceptions noted above, in all cases in which high arrest is not due to bony resistance, but is dependent on rigidity of the soft parts.

Low Arrest from Increased Resistances. When the uterine contractions have been sufficiently powerful to effect the passage of the superior strait, but are unable to overcome the resistance of the inferior strait and of the soft tissues of the outlet, the only conservative operation possible is the application of forceps. The risks of this low operation, even when performed for overtight adaptation, are comparatively so small that it may be properly undertaken not only on the appearance of the least perceptible amount of exhaustion on the part of either patient, but as a matter of routine whenever the second stage has already lasted two hours, and progress is unsatisfactory, or when there has at any time been absence of progress for an hour or even less.

Delayed Third Stage Delay in the expulsion of the placenta may be due to complete or partial atony of the uterus, to the presence of a spasmodic constriction ring in the lower portion of the uterus, or finally, to the existence of morbid adhesions between the placenta and uterine wall.

Inaction of the uterus is usually attended by the appearance of post-partum hemorrhage, for the arrest of which the immediate removal of the placenta is the first essential. If the relaxation of the uterine muscle is not followed by this complication, it may be endured without injury for prolonged periods of time, but the invariable rule to be followed in these cases is that the uterus should be watched by the hand of the obstetrician, or of a trained attendant, during the whole period which intervenes between the delivery of the child and the expulsion of the placenta. The danger of the occurrence of hemorrhage with the uterus in a state of relaxation is, moreover, so great, that if at the end of half an hour spent in the attempt to excite uterine contractions and express the placenta all efforts to this end have proved unavailing, it is usually better to remove the secundines manually.

The presence of a spasmodic constriction ring of the uterus, or of abnormal adhesion of the placenta, is to be diagnosed mainly by the failure of Crédé's method of expression when perseveringly and systematically applied by an experienced hand. When the uterus fails to respond promptly to the hand, an expert operator may occasionally be justified in manual removal of the placenta after the failure of a comparatively few efforts at expression; but the best rule for a young accoucheur is that gentle efforts at expression should be persevered in for at least an hour, provided no serious hemorrhage occurs, before the hand is allowed to invade the uterus in search of the placenta.

If expression fails, and the immediate removal of the placenta is justified by the occurrence of hemorrhage or by prolonged retention, the fingers should be formed into a cone, passed gradually and without force into the uterus, and carried to the fundus. They should be then swept across the fundus until they reach the edge of the placenta, when, if there are no pathological adhesions present, the whole after-birth may usually be swept into the vagina in advance of the hand. If, however, the placenta is adherent to the uterine wall, the adhesions must be divided by gentle sawing and scraping motions of the fingers, care being taken that they are so directed that any laceration which may occur shall be at the expense of the placenta, and not of the uterine wall. The tissues of the placenta may be distinguished from those of the uterus by their greater softness and by their lack of contractility when excited by the pressure of the fingers.

Should the adhesions prove extensive and the separation difficult, the risks attendant on the retention of small fragments of the placenta in utero are decidedly less than those which attend upon unnecessary

wounding of the intra-uterine surface, since such fragments are usually cast off with the lochia and cause no symptoms of importance if full aseptic precautions have been observed.

The manual removal of the placenta should be invariably followed by an antiseptic intra-uterine douche, since the introduction of the whole hand and the use of the finger-nails, by inflicting fresh wounds upon the uterine surface, make the operation the most dangerous of obstetrical manipulations in so far as the possibilities of septic infection are concerned. In the majority of cases in which the manual removal of the placenta is necessary, the elasticity of the perineum is so much increased and the sensibility so much diminished by the distention due to the passage of the child, that fairly resolute women are able to bear the pain of the operation without anæsthesia. In cases in which the pain is unbearable the administration of ether or chloroform is usually permissible, but its use should not be pushed to any unnecessary degree, on account of the increased liability to relaxation of the uterus and post-partum hemorrhage, which is likely to attend its employment at this stage of labor.

PART III.

OBSTETRICAL SURGERY.

CHAPTER XIII.

PREPARATIONS FOR OPERATION. ARTIFICIAL DILATATION OF THE OS. INDUCTION OF ABORTION AND OF PREMATURE LABOR.

PREPARATIONS FOR OPERATION.

Asepsis. Although the observance of strict aseptic precautions is perhaps the most important duty of the attendant in cases of normal labor, these precautions become even more important when operative procedures are contemplated. No added precautions are necessary, however, except a careful sterilization of all the instruments which are to be used and the thorough cleansing of the vagina by a prolonged scrubbing as a preliminary to any operation, since the introduction of a clean hand or instrument into the uterus, through a vagina which is not equally clean, manifestly destroys to a large extent the benefits of personal asepsis, and is unlikely to exclude septic infection.

Sterilization of Instruments. The instruments which are to be used in the operation must be sterilized. The most efficient method of accomplishing this purpose, and the only one which is absolutely certain, is their immersion in boiling water for at least five minutes. This process completely destroys all bacterial life, and if a little ordinary cooking soda is added to the water, will not tarnish the instruments. The rubber gloves which are to be worn during the operation should be sterilized by boiling them in plain water for from three to four minutes, as the use of soda injures the gloves.

The gum-elastic catheter, which is to be used at the commencement of the operation, is the only instrument which cannot be boiled without injury, and must be sterilized by prolonged immersion in a 1 to 3000 corrosive sublimate solution. Care must be taken to see that the fluid has access to the inside as well as to the outside of the tube,

and it is a wise plan to rinse the catheter in sterile water before passing it into the bladder, since the antiseptic may sometimes produce cystitis in a sensitive bladder merely by chemical irritation.

Anæsthesia. The use of anæsthetics during obstetrical operations is, in this country, so nearly universal that no extended discussion of the propriety of their use is necessary. The advantages of anæsthesia are twofold: first, the avoidance of pain and anxiety and the accompanying nervous exhaustion of the patient; and, second, the lessened or abolished danger of abrupt movements of the patient at critical moments which results from its use.

During the delivery by forceps the obliteration of the uterine contraction which attends full anæsthesia is sometimes a disadvantage, but during other operations it is almost uniformly to be desired. It must, however, be remembered in this connection that if anæsthesia is used at all it must always be carried to the fullest surgical degree, since partial anæsthesia not only fails to fully annul pain, but also deprives the patient of her normal self-control and renders the occurrence of dangerously abrupt movements almost a certainty.

The choice of anæsthetics is practically limited to chloroform and ether. It is generally admitted that the dangers of chloroform are far less in midwifery than in general surgery. This absence of risk, though relatively great, is by no means absolute, and the advantages of ether for prolonged administration are very real. The greater care which is necessary in the administration of chloroform, as compared with the possibility of entrusting the ether sponge to an untrained assistant during normal labor, or minor operations, offers so great a contrast that this alone is perhaps enough to decide the choice of ether as the preferable anæsthetic; and this is the more true since the patient's perception of the discomforts of the first stage of etherization are lessened to such a degree by the distraction of her attention due to the presence of the pains of labor that it is often possible to push the ether to full anæsthesia without the provocation of any marked symptoms of discomfort. The most certain method of effecting this very desirable end is to entrust the sponge at first to the hands of the patient, in the manner recommended for the alleviation of the pain during normal labor, and then to gradually increase the dose until consciousness is lost.

It seems probable that the physiological effect of either anæsthetic is so far antagonized by the presence of the pains of labor that the dose necessary for complete anæsthesia is considerably in excess of what would be necessary for the same patient in the absence of pain, and it is certainly a matter of common observation that a patient who has failed to obtain complete anæsthesia during the process of delivery often sinks into profound unconsciousness as soon as the pain has been annulled by the escape of the child. This fact, though ordinarily unproductive of harm, should always be borne in mind

during the administration of either anæsthetic to patients with feeble constitutions or weak hearts.

Position of the Patient. The position in which the patient is placed for operation varies with the nationality of the operator. In England and in some of the Continental nations the lateral decubitus is preferred. In America, however, the lithotomy position, with the patient lying across the bed, the hips well over the edge of the bed and each leg held by an assistant, is almost uniformly chosen; and its adoption will always be assumed in this book unless some statement is made to the contrary.

The physician should always remember to protect the edge of the bed by drawing the rubber sheet well over it, and to protect the carpet by laying a number of old rugs or comforters on the floor under the edge of the bed, in order to prevent soiling by either liquor amnii or blood. The provision of hot and cold water, ice, ergot, brandy, etc., already recommended for normal labor, is, of course, of especial importance in operative cases.

Catheterization. All obstetrical operations should invariably be preceded by an evacuation of the rectum and bladder. The administration of an enema of soap and water is sufficient for the first, but the use of the catheter during childbirth sometimes presents some little difficulty, and must be described in detail. The catheter should, of course, always be passed under the guidance of the eye. The form of instrument which should be used is by no means unimportant. During the puerperium glass catheters may be used, but soft-rubber catheters are unobjectionable and the least disagreeable to the patient. During labor, however, short female catheters and all brittle or soft instruments are mere abominations, whose use should never be permitted. The only instruments fit for use at this time are stiff English-webbing, male catheters of medium size, *i. e.*, 20 to 25 French or 8 to 12 English.

The labia should be separated and the neighborhood of the meatus carefully cleansed with a corrosive sublimate solution. The tip of the catheter should then be slipped into the meatus, and the forefinger of one hand, carefully sterilized, of course, should be passed into the vagina, and should watch the passage of the instrument along the posterior surface of the pubic wall until it comes in contact with the head. In some cases no obstacle is encountered here; but in the majority of cases, if the head is in the pelvis, the passage of the catheter into the bladder is greatly facilitated by moderate upward and backward pressure with the fingers on the presenting part.

The entrance of the instrument into the bladder is signalized by the escape of a jet of urine, but it is essential that its progress should not be arrested here. It should be passed on until the operator ascertains by his tactile sense that its tip has reached the highest point of the bladder, stretched as that organ may be to an extreme

height in the abdomen by its compression between the anterior wall of the abdomen and the distended uterus, or until its hilt is at the meatus. If in this position no urine comes, the catheter should be slowly withdrawn until the flow is observed to start, held in position until this ceases, and again withdrawn gradually, when a further flow is usually observed. This should be repeated until the catheter has been entirely withdrawn.

Too great care cannot be exercised in the evacuation of the bladder, since if even a small quantity of urine has been left behind it may, during the manipulations of delivery, settle into the lower portion of the bladder, which may then by prolapse of the anterior vaginal wall form a sac below the head. If such a sac is formed it is almost certain to be caught between the advancing occiput and the pubic wall, when, its connection with the urethra being cut off, the pressure on it during delivery might result in that most annoying of all obstetrical accidents, necrosis and the formation of a vesicovaginal fistula.

ARTIFICIAL DILATATION OF THE OS.

The delivery of the child, whether effected by art or by the natural forces, presupposes the existence of complete or nearly complete dilatation or dilatability of the os. Since, however, it may exceptionally be necessary to perform any operation in the presence of a partly dilated cervix, we may be obliged to precede any of them by the preliminary procedure of dilatation of the cervix. It is, therefore, proper to open the discussion of operative obstetrics by a discussion of the methods which may be employed for this purpose.

Two methods are at our disposal—the use of Barnes' dilating bags or the use of the intelligent efforts of the hand. The English obstetricians, following the example of the illustrious inventor of the dilating bags, seldom employ manual dilatation, preferring to use Barnes' dilators. In Germany and America, however, the many provoking annoyances and frequent failures of Barnes' bags in contrast with the certainty and efficiency of manual dilatation have led to the abandonment of their use except in exceptional cases.

Barnes' Hydrostatic Dilators. If the dilating bags are used the smallest of the series should be taken first. The tip of a uterine sound should be inserted into the pocket on the side of the bag, which should then be folded around the sound, thoroughly lubricated, and passed into the cervix until its waist is grasped by the os. It should then be held in position with a pair of forceps and distended with sterile water until the edge of the os has been subjected to as high a degree of tension as is considered wise. It is then left in position until it is expelled by the contractions of the uterus, when the same process is repeated with the next larger bag. There are several dis-

advantages attendant on the use of these dilators, none of which apply with the same force to manual dilatation: they can but seldom be used until a certain degree of dilatation is already present; when failure of dilatation is due to inefficiency of the pains they usually fail to excite contractions powerful enough to secure dilatation; and, on the other hand, when the delay is due to rigidity of the os, in the pres-

FIG. 71.

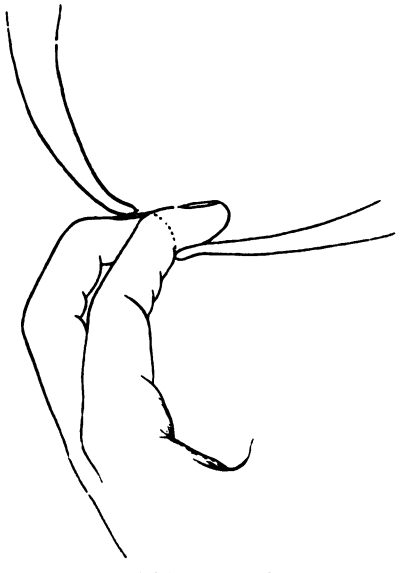
Barnes' hydrostatic dilators and syringe.

ence of good labor, the bag not infrequently ruptures without effecting dilatation. Their action is never rapid enough to be of use in a pressing emergency, and as they are at present made the largest size is too small to dilate the os sufficiently for the performance of any operation.

Manual Dilatation. The operation of manual dilatation, though usually easy and often invaluable, is no light procedure, and must be regarded as a serious obstetrical operation. It not only exposes the patient to increased danger of septic infection, but if clumsily performed is almost certain to result in lacerations of the cervix, and may even injure the uterus or its vaginal attachments. If used as a preliminary to a forced delivery it adds to the gravity of the other

operation proposed. It should never be undertaken without consideration, only under full anæsthesia, and with every convenience which can be afforded by the position of the patient and the presence of competent assistants. In fact, although this operation affords to the skilful obstetrician his most valuable resource for the induction or acceleration of labor, and although its careful performance seldom results in any accident of importance, any clumsiness in its performance or the use of undue force during the procedure may be attended by such immediate and disastrous consequences that the inexperienced accoucheur should not permit himself to employ it without consultation with some older practitioner except in the face of some pressing

FIG. 72.



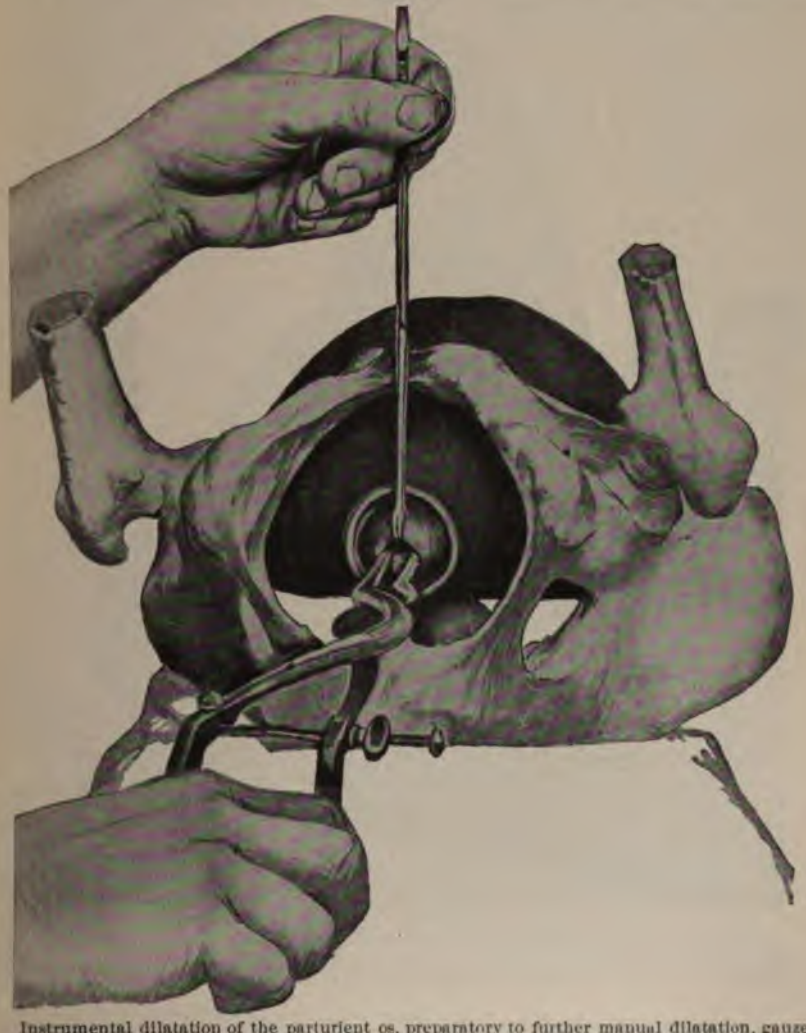
Manual dilatation of the os.

emergency. The operation of full, rapid, manual dilatation must not be confounded with the gentle stretching of the os from time to time, which has been previously recommended.

Everything being in readiness for the performance of the operation, the patient should be placed in the cross-bed position. The catheter should then be passed and the bladder thoroughly emptied. The vagina should then be carefully scrubbed out, preferably with a 1 to 100 solution of lysol, since corrosive destroys the natural lubrication of the vagina. While the hand of the operator or the hands of an assistant make counter-pressure over the fundus of the uterus through the abdominal wall, in order to guard, as far as possible, against any undue tension upon the vaginal attachments of the uterus

(this should be continued throughout the operation), the fingers of the other hand should be formed into a cone and gently inserted through the vulva until the first joint of the forefinger can be passed

FIG. 73.

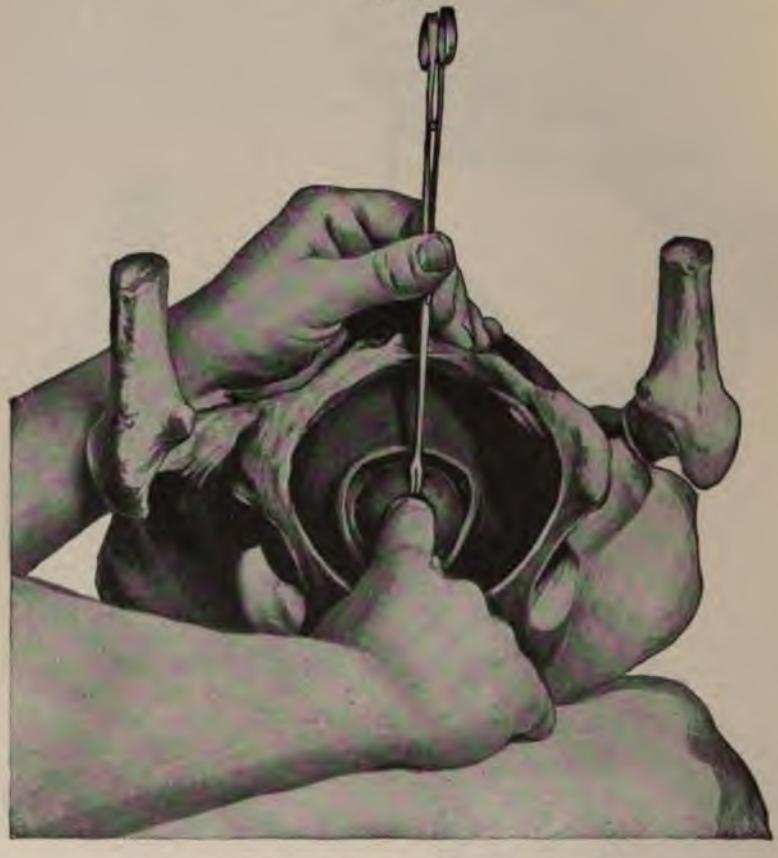


Instrumental dilatation of the parturient os, preparatory to further manual dilatation, gauze packing, and the introduction of bougies or cervical dilators for the induction of labor. (From EDGAR.)

within the os. Should the os resist the entrance of the finger it may be necessary to begin the dilatation by the preliminary passage of a bougie or the cautious use of the steel dilators, but this is rarely necessary. This finger should then be hooked over the edge of the

os, and should exert gentle downward traction while a cautious effort is made to insert the tip of the second finger beside it. This effort should be maintained until the first joints of both fingers are fully within the circle of the os and placed in the position in which they present the greatest surface to it, that is, side by side.

FIG. 74.

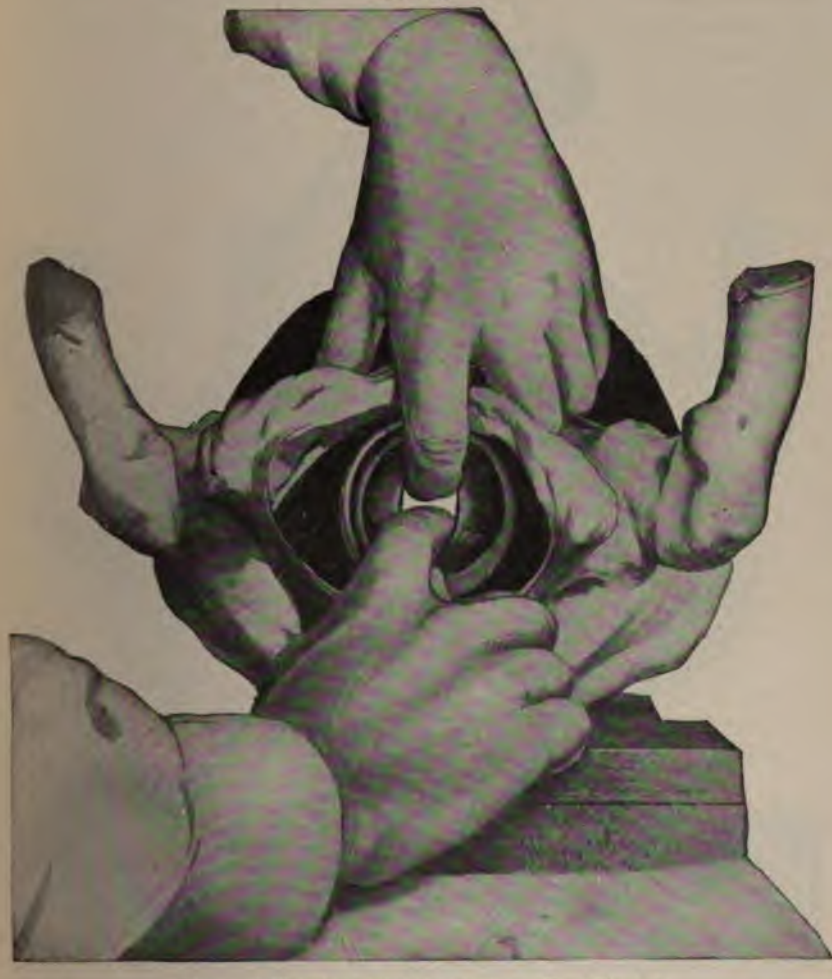


Digital dilatation of the parturient os. (From EDGAR.)
Os admits one finger. Vaginal and supravaginal portions of the cervix present.

Throughout the performance of this operation it must be remembered that the os uteri is not simply an elastic band, nor capable of distention to a marked degree, after the manner of a piece of rubber, but is living tissue and to be dilated only by the relaxation of the circular fibres of the cervix, and that this relaxation is the result of a gradual muscular fatigue due to their long-continued exertions against the obstacle opposed to their contractions by the presence of

the fingers. For this reason, as soon as the edge of the os is subject to distinct even though slight tension, the motion of the fingers should be arrested, and they should be held firmly in situ until the os is felt to relax around them. As soon as this occurs they should

FIG. 75.



Bimanual dilatation of the parturient os. (From EDGAR.)
Os admits two fingers Vaginal and supravaginal portions of the cervix present. Commencing shortening of the cervical canal.

be again advanced until the former slight tension is re-established, and then again arrested until relaxation occurs. This process may occupy many minutes, and frequently subjects the hand of the operator to painful muscular cramps; but it cannot be hurried with any

proper regard for the safety of the patient. This portion of the operation is usually the most difficult and painful for the operator, who rapidly loses all power of controlling the motion of the fingers which are subjected to the uterine pressure. It may occupy from a few minutes to several hours, and in all but the easiest cases is so

FIG. 76.

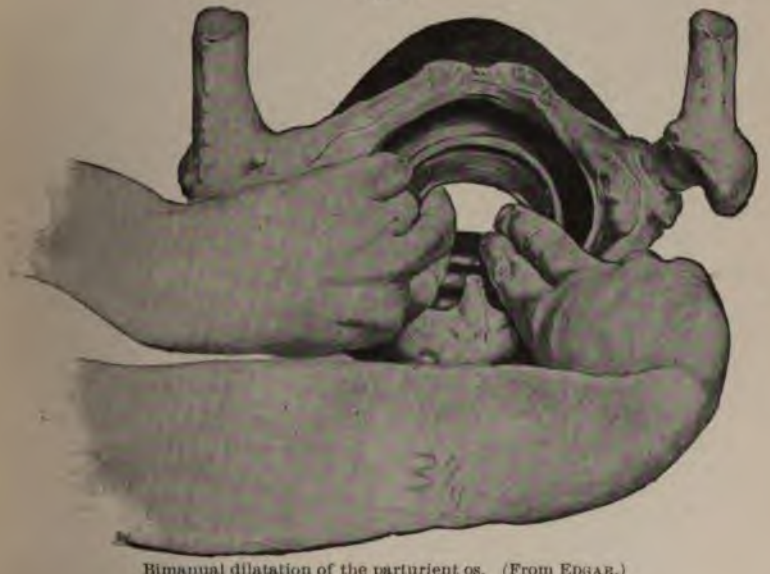
Bimanual dilatation of the parturient os. (From EDGAR.)
Os admits three fingers. Supravaginal portion of the cervix disappearing.

extremely fatiguing as to necessitate a frequent change of hands, and may sometimes prove impossible unless a second operator is present to take the place of the first and afford him needed rest.

It occasionally happens that after the insertion of the first finger the introduction of the second proves impossible. In such cases the

steel dilator may be inserted by the side of the finger and very cautiously expanded until the necessary increase in size has been effected. When the second joints of two fingers are in position the withdrawal of the second finger until only its tip is within the circle will permit the immediate introduction of the third finger by its side, when the process of intermittent dilatation must be repeated with the third and finally with the fourth finger. When the os permits the easy introduction of the third joints of four fingers side by side the thumb should also be introduced. The os should then be kept gently on the stretch by the expansion of the hand, which should again be kept immovable until relaxation occurs and permits the

FIG. 77.



Bimanual dilatation of the parturient os. (From EDGAR.)
Os one-half dilated. Lateral position of the hands.

hand to pass gradually upward until the os is about the wrist. At this point of the operation precautions against undue haste should, if possible, be redoubled, since the moment at which the projecting knuckles pass the os is that at which laceration of the cervix is most likely to occur, and because if any but the gentlest upward pressure is permitted at this time the tension upon the vaginal attachments becomes dangerously severe.

In Harris' method of manual dilatation the thumb and forefinger are first inserted through the os and used to stretch it, and then the other fingers of the hand are successively introduced. This is perhaps a slightly more powerful method than the one just described, and its trial is to be advised if a rapid dilatation is called for.

In Edgar's method the dilatation is begun by the steel-branched dilators and carried to a point which permits the introduction of the first two fingers of each hand through the os. Dilatation is then completed by the forcible stretching of the os with both hands. By this means very rapid dilatation of the os is possible, and a rigid cervix can be dilated with greater ease than by any of the other manual methods; but the employment of this method presupposes

FIG. 78.

Bimanual dilatation of the parturient os. (From EDGAR.)
Os two-thirds dilated. Entire effacement of the internal os.

that the cervix can be brought within easy reach of the vaginal outlet, and it is not applicable to cases in which the cervix is difficult to reach.

Instrumental Dilatation. A more powerful method of dilatation, and one which is to be recommended in all cases in which extreme rigidity of the cervix renders the manual methods difficult or impossible—if not, indeed, in all cases where rapid dilatation is necessary—is the use of the heavy Reynolds dilators, by means of which the

cervix can be rapidly dilated to a degree which permits the free passage of the clenched fist through it without any greater danger of laceration than exists in any method of rapid dilatation, and, moreover, saves the hand of the operator from the fatigue which accompanies all the methods of manual dilatation and which may seriously interfere with the performance of any subsequent operation. In this

FIG. 79.

Bimanual dilatation of the parturient os. (From EDGAR.)
Os is fully dilated and is being stretched and paralyzed to prevent subsequent accidents to the after-coming head during the extraction of the fœtus.

method the cervix is stretched by means of the ordinary steel dilators until the os is large enough for the introduction of the heavier and more powerful instrument. Dilatation is then continued by means of this instrument until full dilatation is reached or until what remains to be done can be easily accomplished by the manual method. The amount of pressure which is to be applied to the cervix must be regulated by the manual compression of the handles, and not by

means of the powerful compression screw with which the instrument is supplied, and should never exceed the amount of force produced by moderate efforts at compression exerted by the thumb and forefinger of one hand. When the edge of the os is subjected to the highest degree of tension which is considered safe, the compression screw should be set to maintain that tension until relaxation of the cervical tissues takes place. This process should then be repeated until the desired amount of dilatation has been produced. The

FIG. 80.

Bimanual dilatation of the parturient os. (From EDGAR.)
External view, after a photograph of the operation as performed at the Emergency Hospital, New York.

whole operation can be performed with the cervix in view, and it is usually possible to accomplish full dilatation without laceration of the cervix.

Throughout the whole operation of artificial dilatation the appearance of even the slightest degree of uterine contraction should be the signal for the immediate cessation of all motion, whether of the hand or instruments, on account of the danger of rupturing the uterus which attends all intra-uterine manipulations during a contraction.

When the cervical dilatation has been so far accomplished that it is possible for the extended hand to be passed into the uterus, this should be done. The hand should then be gently changed into the position of the clenched fist, in which position it attains its greatest circumference, and should then be drawn gently downward against the os, in imitation of the production of dilatation by the natural progress of the advancing head. When the clenched fist can be passed freely backward and forward through the os the fullest dilatation which can be accomplished by artificial means has been reached.

FIG. 81.

Reynolds' dilators.

In the rare cases in which the extreme rigidity of the cervical tissues renders all attempts at artificial dilatation ineffective, and an immediate delivery is imperative, the incision of the cervix to the vaginal vault in one, two, or even as many as four places may be necessary. The incisions are best made with a pair of scissors or with a blunt-pointed bistoury, and their number and length are to be regulated by the amount of dilatation which is necessary to permit the extraction of the child through the cervical canal. As the incisions bleed freely, at least for a time, they must be sutured at the close of the operation; but if the patient is in poor condition, only a single suture should be placed in the upper portion of each incision to control the hemorrhage and to promote proper healing as far as possible.

If the membranes are unruptured at the beginning of the operation, every effort should be made to avoid their accidental rupture and the premature escape of the waters, especially if there is any possibility that a version may eventually be necessary.

INDUCTION OF ABORTION AND OF PREMATURE LABOR.

Conditions which Justify the Induction of Abortion. Artificial abortion is justifiable in two classes of cases: (1) When the delivery of a viable child through the natural passages is impossible, and when the condition of the mother is such that the delivery of the child at term by means of an abdominal operation is contraindicated; (2) when the mother's life is materially endangered by some pathological condition incident to pregnancy, and is likely to be saved by its immediate termination.

The consideration of the first class of indications, and the comparison of the relative advantages of the induction of abortion or premature labor with craniotomy or the Cæsarean section, falls more properly under the treatment of contracted pelves, and will be fully discussed there. The indications which group themselves under the second class are also described in detail elsewhere, under the heads of the pernicious vomiting of pregnancy, incarceration of the pregnant uterus, eclampsia, hemorrhage during pregnancy, hydramnion, anæmia, chorea, and the other general or systemic diseases. To these must be added the occurrence of actual or incipient insanity during pregnancy. It is, however, proper to remind the physician here that, except in the case of insanity, the dangers which threaten the mother are no less serious to the child, whose life is dependent on hers, and that it must always be the gravest of mistakes to sacrifice both lives by an unduly protracted effort to preserve the less valuable of the two.

It may be said here, also, that the occurrence of insanity during pregnancy opens a question of great ethical interest, and one upon which there may be much honest difference of opinion. It is probable, however, that, in view of the almost inevitable inheritance of the child, the majority of physicians would admit the right of the mother to sacrifice the fœtus for the sake of the preservation of her own mental balance.

The induction of premature labor may occasionally be indicated in the interests of the child in cases in which the life of the fœtus has habitually been lost at some period during the last two months of previous pregnancies; but the difficulties which attend not only the diagnosis of such a condition, but also the choice of the proper time for operation, are so great that but few successful cases have been recorded.

Prognosis. Although the work of the professional abortionist is one of the most prolific causes of ill-health in women, and is attended by no insignificant mortality, the induction of artificial abortion should, in skilful and aseptic hands, involve no risk to the maternal life, and in the absence of previous pelvic troubles of inflammatory origin should seldom or never produce local troubles of importance. The prognosis of induced premature labor should differ but little from that of labor at term so far as the mother is concerned. The fœtal prognosis is rather worse than that of premature labor in general.

After-treatment. The care of the convalescence after the performance of artificial abortion differs in no way from that already recommended in the description of inevitable abortion.

Technique of the Induction. Among the means which have been recommended for the induction of labor, the use of drugs, such as ergot, quinine, and jaborandi; of prolonged hot-water douches;

catheterization of the uterus, puncture of the membranes, dilatation of the cervix, and mechanical distention of the vagina are the most prominent and deserving of mention, to which must be added the complete removal of the ovum at one sitting under ether.

The only drug which can be considered to possess any value, except in isolated cases, is ergot; but even that can seldom be relied on to initiate the pains, its chief value being to sustain the action of the other expedients. Even when employed for this purpose its use should be restricted to cases in which the child is dead or has not yet reached the viable age, on account of the fact that its use throws the uterus into a state of tonic contraction, which, if protracted, usually results in the death of the fœtus from interference with the uteroplacental circulation. Of other drugs the statement may be fairly made that, except in cases having a special idiosyncrasy to a given drug, or unless dangerously large doses are administered, no results from their use are to be expected.

Hot-water douches, alone or alternating with cold douches, are somewhat inefficient abortifacients, and are mainly useful as adjuvants in promoting labor induced by other means. If they are employed at all the quantity of water should be large, and the temperature should be the highest which the patient can endure.

The choice between the remaining methods must be made from a careful consideration of the circumstances of the individual case, the principal factors to be taken into account being the condition of the patient and the period of pregnancy at which the induction is to be performed.

Catheterization of the uterus, puncture of the membranes, and dilatation of the vagina all aim at the provocation of the uterine contractions and the termination of labor by natural means. They labor under the disadvantages of being somewhat uncertain in their action, and of subjecting the patient to protracted suffering. They involve much loss of time, and are therefore unsuited to emergencies.

The removal of the ovum at a single sitting under ether avoids all the disadvantages of the slower methods, and is by all odds the best suited for emergencies. It is perhaps always preferable in skilled hands, at least during the first three months of pregnancy, but it cannot be recommended as a routine procedure to the absolutely unskilled.

The Surgical Method. During the first three months the operative procedure is a very simple one. The patient should be anæsthetized and the vagina rendered thoroughly aseptic; the cervix is now dilated with steel dilators to a degree which is sufficient to allow the passage of the fœtus, and the ovum is removed by the finger or the curette. After all traces of the secundines have been removed, the uterus should be douched out with corrosive sublimate and a strip of iodoform or sterile gauze passed to the fundus to ensure proper

drainage. This should be removed at the end of from twenty-four to forty-eight hours. This is unquestionably the most satisfactory operation for the patient as well as for the physician, and may be safely performed by any man who has had an ordinary surgical training, unless the patient's condition is such that it is deemed unwise to subject her to even the slight shock which necessarily attends the operative removal of the ovum under ether.

The Inductive Methods. All of these methods aim at the delivery of the ovum by the natural efforts of the uterus; and since this is better accomplished when the membranes are intact, those procedures should be selected which avoid puncture of the membranes.

When, for any reason, the surgical method is ruled out, success is usually best attained by combining the remaining methods of catheterization of the uterus and distention of the vagina.

Many methods have been recommended for this purpose, but catheterization of the uterus is generally to be preferred. A small, solid bougie—10 to 12 French—with a very flexible tip, should be carefully introduced into the os and passed well within the uterus in the most gentle manner, and, if possible, without rupture of the membranes. It should be retained in position by a firm packing of the vagina. The bougie should, of course, be a new one, and sterilized by prolonged soaking in corrosive sublimate. The packing should be introduced through a Sims speculum, and should thoroughly distend the vagina. The patient should now be given 20 minims of the fluid extract of ergot every four hours. If at the end of twenty-four hours no descent of the ovum has been produced it is probable that the decidua are abnormally adherent, that the uterus is extremely irresponsive to stimulation, or that the membranes have been ruptured during the introduction of the bougie, and that the bulk of the ovum has been thereby so much reduced that the uterus is unable to expel it. Even if this should prove to be the case, examination at this time will probably show the cervix so much softened that it can be readily stretched by a gentle use of the steel dilators to a point which will permit the removal of the ovum by the finger or by the curette without anæsthesia.

If the removal of the ovum by this method is followed by troublesome and persistent bleeding it is probable that some portion of the decidua still remains in the uterus, and it should be thoroughly curetted.

If pregnancy has advanced to more than three months the surgical method is less well adapted to the needs of the case unless immediate delivery is indicated in the interests of the mother, and the most satisfactory procedure is to dilate the cervix freely under ether and pack the lower uterine segment with gauze, after which the vagina should be tightly packed and the advent of the pains awaited. If for any reason this method is considered undesirable the use of the

bougies as described above may be substituted. If these methods fail the surgical method must be employed, and would be preferred by an expert operator even at this period of pregnancy.

PREMATURE LABOR.

From the beginning of the seventh month, or perhaps a little earlier, a new factor enters into the problem, for the fœtus is now viable and must be considered in any operation which may be undertaken. It must be remembered that the vitality of premature children is small, and that they can offer very little resistance to the exhausting effects of a prolonged labor. It is, therefore, important to use every effort to secure as complete dilatation of the os as possible before the rupture of the membranes, in order to avoid the pressure of the uterus on the child and the delays of a dry labor.

The only operation to be recommended at this period of pregnancy is the dilatation of the os manually, or by means of the steel dilators under ether, and the packing of the lower uterine segment and vagina with gauze, when the subsequent progress of the case may be left to nature, it being almost certain that strong and efficient labor will shortly be initiated. It must always be remembered that in these premature deliveries the interests of the child demand earlier interference, if progress is unsatisfactory, than if the child were at term, on account of the slight resistance the child can offer to the exhaustion of a prolonged labor.

CHAPTER XIV.

FORCEPS.

CHOICE OF FORCEPS.

BEFORE describing the technique of forceps operations it is necessary to say something about the choice of instruments. So many varieties and modifications have been described by various obstetricians that it is impossible to even mention any but the most important and those which are most typical of a class. The instruments in common use may be divided into short forceps, long forceps, and those furnished with axis-traction attachments.

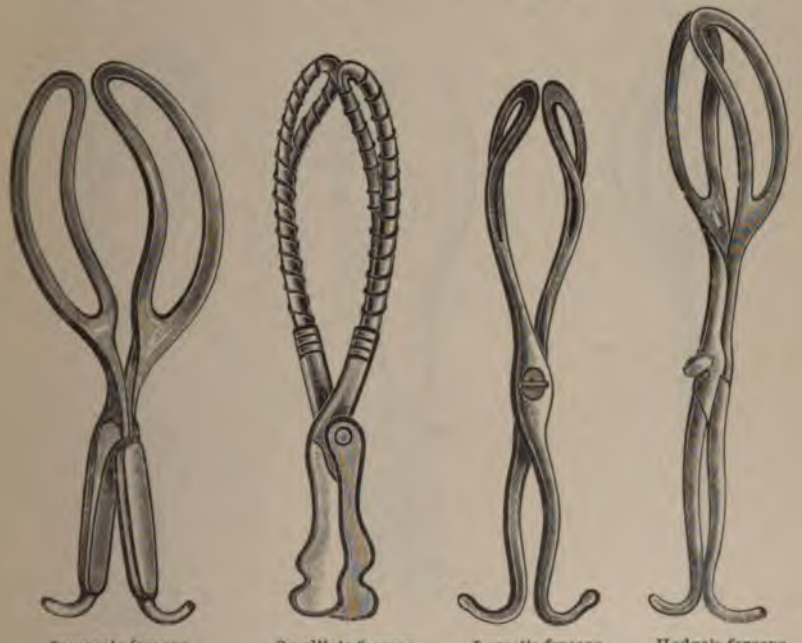
Short Forceps. Short forceps are intended for use when the head is at the pelvic outlet, and have a cephalic, but no pelvic curve. Their only advantages are the small space they occupy in the obstetrical bag and a slightly greater ease of application; but since a pair of short forceps alone is never a sufficient equipment, they are practically an extra luxury, since anything which can be done with them can also be done with the long forceps. The preferable form of short forceps is that known as Sawyer's. (Fig. 82.)

Long Forceps. Long forceps are intended for use in any portion of the obstetrical canal, and possess both pelvic and cephalic curves. Among the instruments in use to-day we can trace the influence of the two original types—the Levret and Smellie models. Smellie, aware of the necessity of high forceps operations, but strongly impressed with their dangers, sought to lessen these risks by shortening the handles and so reducing the compressive power. Levret, on the other hand, preferred to equip himself with a powerful instrument and trust to his own discretion for caution in its use. Instruments but slightly modified from the original model of Levret are still in use in France, but are seldom seen in this country. Among the forceps which stand high in the esteem of the profession in America the Hodge and Wallace instruments follow the type of Levret (Fig. 84), while Simpson's, Elliott's, and the Vienna forceps (Fig. 93) tend rather to that of Smellie.

Hodge's forceps are shorter, lighter, and more graceful than the original French model, and the fenestræ are wider, but the instrument retains the long metal handles and the French or pivot lock. Wallace modified Hodge's instrument by adapting to it the peculiar blades devised by Davis, of London. Both are excellent models, and have many admirers.

Simpson's forceps, the most widely known of all those which follow the Smellie type, have longer shanks and a sharper cephalic curve than the Hodge or Wallace instruments. They are fitted with the English or mortise lock, the handles are shorter, and are furnished with transverse shoulders for the upper or traction hand, with indentations to fit the fingers of the hand that grasps them. This model is exceedingly well qualified for grasping the head in any position, and for use as a tractor, but is not capable of very forcible compression—a qualification which is, perhaps, a great advantage for the majority of operators.

FIG. 82. FIG. 83. FIG. 84. FIG. 85.



Sawyer's forceps. Smellie's forceps. Levret's forceps. Hodge's forceps.

Braun's modification of Simpson's forceps—the so-called Vienna forceps—differs from them only in some slight modifications in the weight and proportions of the instrument. The well-known Elliott forceps are a long, highly curved, and somewhat heavy modification of Simpson's. Their distinguishing feature is the addition of a thumbscrew, by which the separation of the handles can be regulated —a device which, though sometimes of convenience, is distinctly unnecessary, since its function in preventing undue compression of the head can be performed equally well by a folded towel placed between the handles. It is, moreover, extremely difficult to keep clean.

In all modern forceps, no matter what model they follow, metal handles have been substituted for wood and hard rubber, which makes them much more easy to sterilize.

A few operators who believe that non-fenestrated blades are less liable to injure the soft tissues of the head and pelvis have constructed instruments on this plan, those of Winckel and McLean being the best known. The advantages claimed for these models are probably more than counterbalanced, however, by their encroachment on the already scanty pelvic space.

The choice between these various types of instruments is regulated largely by fashion and by local prejudice. It is undoubtedly true

FIG. 86.

Wallace's forceps.

FIG. 87.

Simpson's forceps.

FIG. 88.

Elliott's forceps.

that it is far more important that the individual instrument should be well made than that it should follow one or the other model.

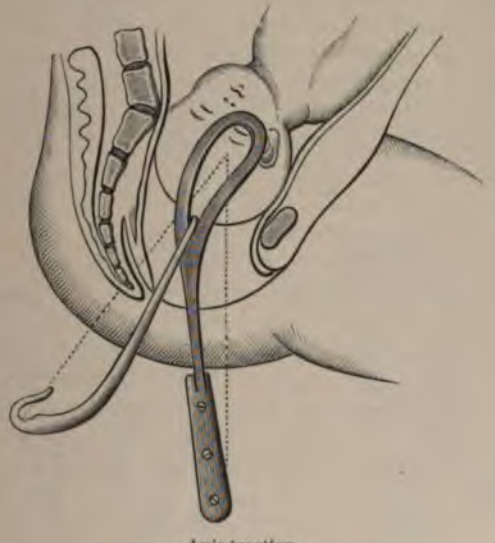
The points which should be most carefully insisted on in any forceps are: well-rounded, blunt edges; firm, well-tempered blades; strong shanks with but little spring; all-metal handles, and a close but not too tight adjustment of the locks. Other things being equal, the English mortise lock is decidedly preferable to the French pivot lock, both on account of greater facility of adjustment and of greater ease in cleansing it.

Before the introduction of axis-traction the possession of a single pair of good, long forceps was amply sufficient for all the needs of

ordinary practice; but now the operator who intends to do high forceps, and wishes to give his patients all the advantages of modern improvements, must have in addition some form of axis-traction instrument. He can only be possessed of a complete equipment within the compass of a single forceps, by adopting one of those models which are furnished with accessory axis-traction appliances, and which are so little modified that the blades when the axis-traction rods are removed, are still suitable for low operations.

Axis-traction Forceps. It has long been known that when the forceps are applied to the head at the superior strait and traction is made upon the handles, the line of traction is such that under the most favorable circumstances a large portion of the force expended is wasted in compression of the head against the anterior pelvic wall. From an early date many efforts have been made to alter the line of traction, either by bending the handles backward, or by attaching rigid traction arms to obtain a similar effect. The exact line in which traction should be made varies, however, so much with the varying presentations and positions of the head, and with the variations in form in individual pelves, that the line of traction furnished by any rigid instrument is likely to be but little less erroneous in a given case than is that of the simple instrument, and the advantages of these rigid forceps proved to be so slight that none of them ever attained any wide-spread popularity.

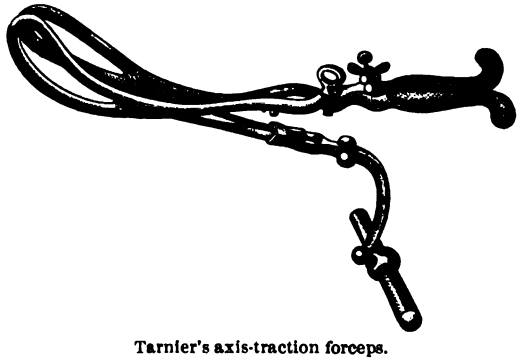
FIG. 89.



Axis-traction.

It remained for Tarnier to invent the first really useful axis-traction instrument (Fig. 90) by adapting to the ordinary forceps a

FIG 90.



Tarnier's axis-traction forceps.

pair of curved rods attached to the blades at a point close to their grasp on the head by a freely movable joint. With this appliance, if

FIG. 91.

FIG. 92.

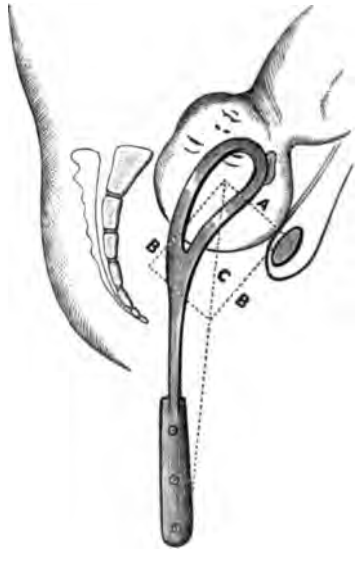


FIG. 91.—Breus' forceps.

FIG. 92.—Diagram of forces illustrating axis-traction. If the line C represents the amount and direction of the traction force which is applied to the handles of the forceps, the line B represents the amount of force which is utilized in extracting the head, and the line A that which is wasted in compressing it against the pubes.

traction is made in an even approximately correct direction, the head moves automatically in the direction of least resistance under the

influence of the mechanical forces involved, and the delivery is effected with the least possible waste of energy. It is a noteworthy fact that all the successful instruments which have followed his first model, including the many modifications which he has produced himself, have been mere attempts at simplification of his device, without any essential alteration of its plan, with the single exception that the forceps of Breus, which were once widely used in Germany, varied from that of Tarnier in having dropped axis-traction as such, and retained as their essential feature only the movable joint between the head and traction handles, which Breus considered the only valuable element in any of these instruments. Tarnier's original model possessed two antero-posterior curves, and was unnecessarily complicated. It was soon modified by its author, whose latest model is one of the most graceful and convenient yet devised. One of the best known of American instruments, Lusk's modification of Tarnier, on the contrary, retains the extra curve. Though this instrument is undoubtedly convenient for use in some difficult cases, its greater difficulty of application makes it less valuable for general use. Simpson's axis-traction forceps are merely a somewhat long and heavy Simpson forceps to which axis-traction rods have been attached by a screw and nut. Its sole objection is that it is difficult to clean. Felsenreich has improved upon this instrument by attaching the rods to the blades by the joint commonly used in surgical scissors, and by adding a detached compression screw which fits with a slot upon the handles. The forceps themselves are practically unmodified and are fit for common use. The authors have used for some years with much satisfaction an appliance (Fig. 93) which was devised in accordance with the belief that it is a decided advantage to the general practitioner to use one pair of forceps, with the curves of which he is thoroughly familiar, for all emergencies, and that it is a practical advance to supply an axis-traction attachment which can be applied to any pair of forceps without the necessity of making any alterations in them.

This contrivance consists of a pair of steel rods, which terminate at their upper ends in flat buttons, intended to engage in the lower extremity of the fenestræ of the forceps, and at the upper end in hooks which are received by rings connected with a transverse traction handle. A separate compression screw for fixation of the handles is a convenient but not an absolutely necessary accessory. The instrument is simple and easily cleaned, and when the rods are applied is similar in all respects to the Simpson model.

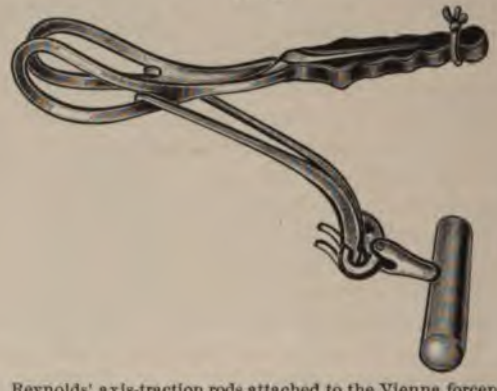
The rods may be hooked into the blades after the latter have been adjusted to the head, but most operators prefer to place them in position before making the application.

Axis-traction is of value only while the head is above the inferior strait, and is consequently applied only to long forceps.

Forces of the Forceps. The forceps is an instrument capable of exerting three different forces—traction, compression, and leverage.

Traction is the essential force of the forceps. The constant need for the application of this force led to the invention of the instrument, and operators of limited experience will act most wisely by restricting themselves in their early operations to the use of this force alone. Compression of the head by forced approximation of the blades is a force which is never entirely absent, since a certain amount of compression must always be employed in securing a firm grasp on the presenting part, and the amount of compression which is incident to the careful use of forceps is never injurious. The injudicious use of too great an amount of compression is, of course, without danger to the mother, but it exposes the child to the most serious risks of fatal injury, and is indeed the only element in the use of forceps which can be injurious to the child.

FIG. 93.



Reynolds' axis-traction rods attached to the Vienna forceps.

The amount of compression which the fœtal head can bear without injury is largely dependent upon the diameter to which the force is applied. It may be laid down, as a rule, that the compression of the biparietal diameter to an extent of not more than half an inch is seldom harmful if not continued for more than two minutes at any one time. Compression of the occipitofrontal diameter to the same extent is about equally well borne. On the other hand, diminution of the oblique diameters of the head—*i. e.*, those drawn from either side of the brow to the opposite side of the occiput—is far more likely to cause intracranial injury. Even in these diameters, however, an intermittent compression of not more than half an inch is comparatively safe in the majority of cases.

Continued compression, or an intermittent approximation of the blades of beyond half an inch, is, however, so full of danger to the child that the greatest care must be taken to guard against its unin-

tentional application, and it should certainly never be applied intentionally. In the rare cases in which the operator finds himself unable to avoid a greater degree of compression he should always feel that he is running great risks of sacrificing the child's life. Had such difficulty been anticipated, a major operation should probably have been performed.

The cephalic curves of all good forceps are so wide that when the blades are applied to the sides of the ordinary head the handles come so nearly in contact that a dangerous amount of compression is impossible. If it is impossible for any reason to secure such an application, and the handles of the forceps are found to be widely separated when the instrument is in place, the use of traction must necessarily expose the child to grave danger of undue compression, unless special precautions are adopted. With the Elliott forceps this danger may be avoided by so setting the thumb-screw, which is their special feature, that it is impossible to exercise a greater degree of compression than is considered safe. The same object may be equally well attained with other models by the insertion of a folded towel between the handles.

Leverage is a force obtained by lateral or antero-posterior pendulum movements of the handles. By the use of leverage it is sometimes possible to overcome an arrest which has resisted simple traction.

It is so difficult, however, for the operator to estimate the amount of force he is using, and the danger to the soft parts of the mother is so great, that the use of this method is distinctly inadvisable for any but the most expert operators. The beginner may feel sure that by the time his experience justifies him in the use of leverage, he will find himself so fully impressed with its dangers that he will reserve it for a last resource, or more probably will never use it.

Rotation of the head by the forceps is closely analogous to the employment of the pendulum movement, and is, indeed, in effect a form of leverage. Forced instrumental rotation is so extremely likely to result in extensive lacerations, and its safe performance implies such an accurate adjustment of the blades, and such an instinctive knowledge of the position of their tips, that its use should be restricted to experienced operators; but even the beginner must be careful to avoid disturbing the mechanism of delivery by the prevention of rotation. In other words, whenever the forceps are applied before rotation is complete the operator must bear carefully in mind the direction in which the head will naturally turn, and be ready to permit or, indeed, favor its occurrence.

Anæsthesia in Forceps Operations. It is probable that the skilful use of forceps is but slightly more painful than normal delivery, and the presence of the pains in an unetherized patient may greatly facilitate the extraction of the child; but most patients have such an

instinctive dread of any operative interference, that its performance without ether is apt to be followed by a very undesirable amount of nervous exhaustion. All women are, moreover, prone to attribute any pain which they may feel during the performance of any operation to the efforts of the physician, and to resent its infliction by unguarded movements, which may often result in unnecessary laceration. It is, therefore, customary in all but the crudest practices to administer an anæsthetic before making even a low application of the forceps, unless some absolute contraindication exists; and it is rarely wise to attempt even the simplest of high operations without the use of ether or chloroform.

If anæsthesia is not employed the forceps should be warmed before they are applied.

Conditions which Justify the Application of Forceps. Forceps may be applied to presentations of the cephalic extremity, to the full breech, and to the after-coming head in breech or version deliveries. The conditions which must be present to justify their use are ruptured and retracted membranes, sufficient dilatation of the os to permit the easy introduction of the blades, and the existence of a possibility of delivering a living child unless the operation promises to be easy.

Contraindications. Forceps should never be applied to a hydrocephalic head, nor to the head of a dead child unless the operation promises to be easy.

They should never be used on a putrid fœtus or a perforated head. The use of forceps upon hydrocephalic or putrid heads is dangerous to the soft parts of the mother, since the uncertain grasp of the forceps on the soft and yielding head renders them extremely likely to slip, and in these cases there exists no objection to the performance of craniotomy. The diminished size of the perforated head makes the forceps extremely liable to slip from its surface, an accident which is likely to result in the production of extensive lacerations, and in these cases the cranioclast is by far the best extractor.

Classification of Forceps Operations. Forceps may be applied to either extremity of the child in any portion of the pelvic canal, but the severity and technique of the operation vary so greatly with the amount of progress already effected that it is necessary to consider the application of forceps to high and low heads under separate headings. The method of application should, moreover, be so radically altered in accordance with the varying presentations and with the position of the presenting part, that it seems most conducive to clearness to describe the general principles which should be followed in all forceps operations under the head of the anterior positions of the vertex, high and low, to which the remainder of this chapter will be devoted. The application of forceps to other presentations and to posterior positions of the vertex will be described in the chapters devoted to the general management of these cases.

Skill in the use of forceps, that is to say, the instrumental extraction of the child with a minimum degree of force and a minimum degree of danger to both patients, is almost entirely dependent on a careful imitation throughout the operation of the mechanism of natural labor in the given presentation and position. With ordinary closeness of adaptation it is impossible for the head to pass through the pelvis by any other method than this, except under the influence of an extreme and unnecessary degree of force. The quality of an operator's work is, therefore, essentially dependent upon the correctness of his diagnosis of position and his instinctive knowledge of the mechanism. It should be an invariable rule that his last act before applying the forceps should be an effort to obtain an accurate perception, not only of the quarter of the pelvis in which the occiput lies, but of the exact direction of the sagittal suture and the situation of the parietal bosses. The importance of avoiding any mistake in this matter is so great that it is a safe rule that forceps should never be applied unless both fontanelles, or one fontanelle and an ear, have been definitely recognized.

As a last step before operating the catheter should be passed, and the operator should himself listen to the fœtal heart, in order to form an estimate of the condition of the child and of the amount of delay he may permit himself in the effort to avoid laceration of the perineum.

Low Forceps in Anterior Positions. PROGNOSIS. The application of forceps when the head is within the excavation of the pelvis and the occiput is anterior is distinctly a minor operation. The prognosis in operations of this class is practically unchanged from that of normal labor for either mother or child, except for a slightly increased risk of laceration of the perineum and such slight risks as exist in every case of anæsthesia. The outlook for the child is better than if it is subjected to the pressure of a long second stage.

INDICATIONS FOR LOW FORCEPS IN ANTERIOR POSITIONS. The risks attendant on the performance of low forceps operations in anterior positions are so slight that the application may properly be made for relatively slight indications. The practice of different accoucheurs differs widely, but it is safe to say that whenever the second stage of labor has lasted two hours, and the rate of progress is such that there seems to be no probability that spontaneous delivery will be accomplished within the next hour, a sufficient indication exists. The fœtal mortality is, moreover, smaller if immediate delivery be resorted to in these cases than if they are left to nature, and an even earlier application is often wise.

TECHNIQUE. In any case the application of the forceps may be made in two ways: the blades may be so introduced as to be adjusted exactly to the sides of the head; or they may be so placed as to lie one on each side of the mother's pelvis, without regard to the position of the head or how they grasp it. Either of these applica-

tions may be made by two methods: the forceps may be passed directly into the position they are expected to occupy; or each blade may be introduced opposite the corresponding sacro-iliac synchondrosis, and then swept around the side of the head into position.

The application of the blades to the sides of the child's head is, perhaps, slightly the more difficult, but it has two great advantages. When the blades are in this position they have much less tendency to interfere with the normal mechanism of labor, and, moreover, the risk of injury to the child by undue compression is much diminished. It may occasionally happen in difficult operations that an inexperienced operator will find it difficult to place the forceps accurately over the parietal bosses, but such cases are very rare in low applications to the anterior occiput, and in low arrest the accoucheur should never be satisfied with any other application.

In anterior positions the direct method of application is usually easy and should generally be adopted, because it exposes the tissues to a minimum amount of friction against the instrument and a minimum risk of laceration.

The patient being in position, the catheter having been passed, and all preparations being made, the operator should lock the forceps outside the vulva, in order to avoid a mistake in the choice of blades, and should place them in the approximate position in which they will lie when applied to the head—*i. e.*, with their transverse axis at right angles to the line of the sagittal suture. He should then select the left blade, that is, the blade which is to lie on the left side of the mother's pelvis, and whose handle is grasped by his left hand. The left blade is ordinarily passed first, because the conformation of the lock of the forceps is such that the application of the right blade after the left one is already in place makes the locking of the blades more easy than if the left blade is passed after the right one. The handle of the selected blade should then be lightly seized by the thumb and two fingers of the left hand in the manner in which one holds a pen. Two or more fingers of the right hand should be passed as high as is possible without undue force between the head and pelvic walls, opposite the parietal boss over which the blade is to be adjusted. If any part of the cervix is still recognizable, the fingers should be inserted within the os between the head and uterine wall. If by any chance the membranes are still intact, they should now be freely ruptured, as the application of forceps in the presence of intact membranes is an inexcusable blunder. The forceps blade should hang loosely from the fingers by its own weight. It should be passed into the vagina along the palmar surface of the vaginal hand and urged onward into position by pressure with the right thumb against its heel. The edge of the blade should rest in the groove between the fingers, so that as the tip advances the fingers have an accurate perception of the double curves of the instrument, and are able to

estimate accurately the position of the tip during the whole process of introduction. The most common mistake made by young operators is to attempt to push the blade onward in the straight line of its handle, instead of bearing in mind the fact that the proper introduction of the blades requires a constant remembrance of its compound curve, and that the handle must not only be gradually and smoothly depressed in obedience to the pelvic curve of the blade, but must be simultaneously rotated upon its own axis, in order to ensure a constant and close application of its cephalic curve to the tissues of the scalp. During the whole process of introduction the tip should be kept in close contact with the head and the forceps allowed to guide themselves in the line of least resistance, no force being used.

If the entrance of the blade is arrested it may be taken for granted that its failure to advance is due to the fact that the tip has been

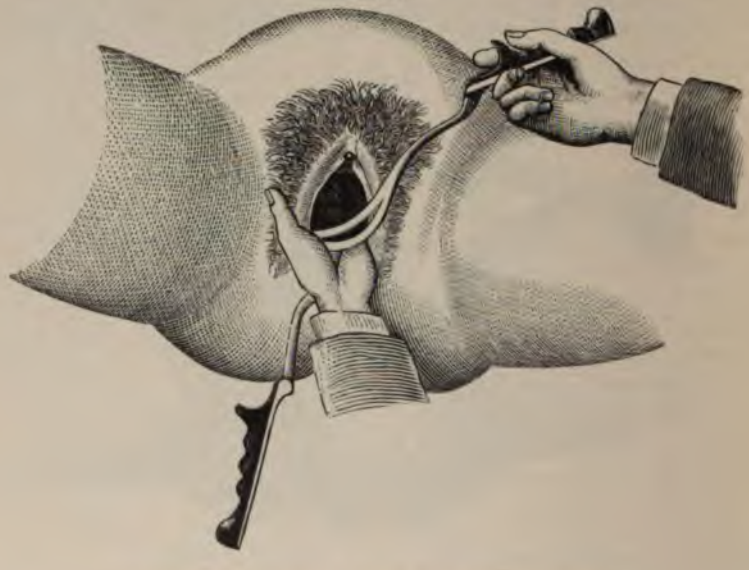
FIG. 94.

Introduction of the left blade of the forceps. (PARVIN.)

given a false direction and is pressing too hard against either the maternal soft parts or the fœtal scalp. Under such circumstances the use of forceps can only result in injury, but progress will readily be made without any increased pressure on the handle as soon as gentle movements of adjustment have guided the tip into its proper situation. When the first blade is in position its handle should be given to an assistant, who must hold it with the palmar surface of his hand uppermost, in order to keep his wrist out of the operator's way, and who must be careful to maintain it in the exact position in which it was given to him. The second blade is then introduced in the same manner on the opposite side of the head, and during its passage into position its movements should be so guided by gentle manipulations with the internal hand that when it is finally in place

its handle is directly opposite to that of the first blade, the position of which acts as a guide for the introduction of the second. If the blades are exactly opposite each other, the forceps will lock without force, but if, owing to some fault of application, this does not occur, it is better to remove the second blade, and re-apply it, than to use any but the most minute efforts of adjustment. Eversion of the forceps tips by rotation of either blade on its long axis to more than a minute degree is an experiment which is especially dangerous and to be avoided. During the locking of the forceps the operator should be careful to see that no portion of the vulva or vulvar hair is pinched within the lock of the forceps, as this is an accident which is produc-

FIG. 95.



Introduction of the right blade of the forceps. (PARVIN.)

tive of the utmost pain if the patient is unetherized, and which may in any case result in the production of serious contusions.

If at the conclusion of the application the blades lie in the proper position, with each fenestrum including a parietal boss and its corresponding ear, the handles should come together without force. If, however, they remain slightly separated, it is probable that the head has been clasped, not by the biparietal, but by one of the long oblique diameters. Should this be the case it is usually better to remove and re-adjust the blades than to subject the child to the increased risk of compression which this application involves.

If the indirect method of application is chosen, each blade should be introduced and passed to the full height necessary, in the space

opposite the corresponding sacro-iliac articulation, or at any other part of the pelvis which seems to afford the most room. The blades should then be swept into position and adjusted to the sides of the head by pressure with the internal fingers on the edge of the blade. Care must be taken that the whole surface of the cephalic curve remains closely applied to the head throughout the whole procedure.

When the instrument has been satisfactorily adjusted to the head, and the blades locked, the operator should grasp the handles with his left hand, keeping the palm uppermost. The right hand should be placed over the left with its palmar surface downward, and with the shanks of the forceps lying between the second and third fingers.

FIG. 96.

Forceps applied at inferior strait: occiput to left acetabulum. (HIRST.)

The first tractions should be gentle, and gradually applied, in order to test the security of the grasp of the forceps upon the head, and thus guard against their slipping in case an error in the diagnosis of position has been made. When the operator is fully satisfied that the instrument is unlikely to slip he should gradually increase his effort until the maximum force he thinks advisable has been obtained, and should maintain it at that height for a space of one or two minutes, and then gradually allow it to decrease in imitation of the natural pains.

When the forceps have been applied through the partly dilated cervix, the amount of tactile force which is applied should be

estimated by ocular or digital observation of the degree of tension to which the edge of the os is subjected, precisely as is done in the preservation of the perineum. In case the cervix should be found so rigid as to obstinately resist dilatation, or if the usual bilateral laceration is seen to begin, antero-posterior incision of the edge of the os to a depth of from one-fourth to one-half an inch usually determines the advent of laceration in that direction, and offers a justifiable expedient, because antero-posterior lacerations usually heal spontaneously during the puerperium.

If the forceps lie in an oblique diameter of the pelvis, the operator should be especially careful that his grasp upon the handles opposes no obstacle to the rotation of the forceps with the head, which is sure

FIG. 97.

Protecting the perineum in delivery with the common forceps. (PARVIN.)

to rotate to the arch as soon as the resistance of the pelvic floor is met with. If the blades have not been accurately adjusted to the sides of the head, the handles should be gently separated during the intervals between the tractions in order to intermit all compression, and thus, perhaps, permit the head to rotate within the blades. The first traction should be directed as far backward as the perineum permits, but as soon as this is put upon the stretch by the advance of the head the handles should move gradually upward, their axis being directed a little higher with each successive traction. The proper direction for each traction is determined by the extent of the tension to which the perineum is subjected on the one hand and by the amount of pressure which exists between the occiput and pubes on the other. This may be learned with accuracy by the occasional

passage of one finger between the head and pubes during traction. The ideal line of force is always that which holds the head in contact with the anterior pelvic wall, and but lightly applied to it.

When the occipital protuberance appears under the symphysis, the shanks of the forceps should be steadied by the right hand, while the left changes its grasp and seizes the handle with its dorsal surface upward. The operator should then stand opposite the patient's left buttock (Fig. 97), and while continuing gentle traction directly upward, should sweep the handles forward toward the mother's abdomen in the curve of Carus. The head is thereby extracted by a mixed movement of descent and extension, during which the sub-occipitobregmatic diameter describes the arc of a circle around the lower edge of the pubic arch as a centre. The right hand observes and controls the movement by pressure upon the forehead through the tissues in front of the anus, in the manner described in the section on normal labor.

When the edge of the anterior fontanelle appears at the fourchette, the procedures adopted by different operators vary. Some prefer to control the head by retaining the forceps in position, in the belief that the effort to remove them before delivery is completed is likely to be of itself productive of laceration. Others feel that this danger is more than counterbalanced by the relaxation of the tissues which results from the extra space gained by the removal of the forceps.

If the latter method is chosen, two fingers of the right hand should be inserted into the rectum until they reach the chin, before the blades are taken off. During the removal of the blades the advance of the head must be controlled by pressure of the right thumb against the occiput, if this be possible, or by the hand of an assistant.

The forceps should then be unlocked and the left hand should withdraw whichever blade seems the less firmly fixed. The proper motion of withdrawal is the exact reverse of the spiral curve which was followed in the introduction. Should the blade first selected be arrested when partly withdrawn it should be steadied by an assistant until after the removal of its fellow, when it will probably be released by the additional space gained. If, however, one or both blades are firmly held, it is better to abandon the attempt to withdraw them rather than use any force, since either of them may be looped about an ear, and any force might result in its laceration.

If the operator prefers to complete the extraction by means of the forceps, he should continue his tractions with them in the curve of Carus, watching the perineum closely.

Flexion of the head should be maintained both by means of the forceps and by pressure upon the forehead through the tissues around the anus, forcing the head to hug the symphysis as closely as possible.

The operator must hold himself constantly in readiness to check any unduly rapid advance of the head, by backward pressure with

the instrument or by pressure with the fingers of the right hand on the occiput.

High Forceps. PROGNOSIS. The application of high forceps in anterior positions differs from the low operation in being far more serious. It not only exposes the mother to grave risks of serious laceration, but it necessarily involves the danger of serious compression of the fœtal head, which results in a by no means inconsiderable fœtal mortality, even in the hands of the best operators.

INDICATIONS. The operation should never be undertaken unless some pathological condition renders the dangers of delay to mother or child distinctly greater than the risks of operative interference, or unless the arrest of progress is so complete that there seems to be no prospect that the head will pass the superior strait under the forces of nature, and the exhaustion of one or the other patient is already imminent. The discussion of the various pathological conditions which justify immediate delivery must be relegated to the chapters devoted to those complications.

The best rule for the application of high forceps for the treatment of simple delay is that when the caput is large and increasing, when the fœtal heart or maternal pulse is steadily and perceptibly rising, or no progress has been made for at least an hour, and the conditions warrant the belief that none will be made, the forceps should be applied. In view, however, of the great increase in the fœtal mortality which occurs when the operation is delayed until exhaustion is already present, it should be an invariable rule that the physician should maintain a most careful watch over the condition of the fœtal heart whenever the progress of the head through the superior strait is at all unsatisfactory.

The difficulties of making high applications of the forceps are often so great that, unless in exceptional circumstances which contraindicate the use of an anæsthetic, it is distinctly unwise to attempt any high operation without the use of surgical anæsthesia.

TECHNIQUE OF HIGH APPLICATIONS. In high as well as in low operations the application of the blades to the points of election at the sides of the head is a distinct advantage to the child as well as to the mother. With proper care a persistent and skilful operator will rarely or never fail in making such an application in normal pelves. The difficulties are, however,[1] sufficiently great to deter many excel-

[1] The importance of an exact application of the forceps to a high head, and the extent to which the tips may encroach upon the maternal tissues in oblique applications, with one of the accidental disadvantages of such inaccuracies, are well exemplified by a case in which the author had occasion to perform a high forceps operation without ether, and, failing to apply the blades accurately to the sides of the head at the first attempt, made traction with the blades in a position corresponding to the sides of the pelvis. Having assured the patient that the operation would not be attended with excessive pain, he was much chagrined to hear her scream with agony during each traction, complaining that she was tortured with excruciating pains which extended from one hip to the corresponding knee. In the belief that some projecting part of the blades must be exerting pressure upon the intrapelvic portion of the sciatic nerve on that side, the blades were removed and re-applied to the sides of the head, when a somewhat forcible extraction was performed without any recurrence of unbearable pain. The case also suggests the possibility that a clumsy operation may be the starting point of the intractable sciaticas which not infrequently make their appearance shortly after labor, and which may then continue for many years.

lent authorities from recommending the attempt to the inexperienced, but the diminished percentage of lacerations and the decrease in the fœtal mortality due to such exactitude of application are so great that the authors believe that every obstetrician should teach himself to apply the forceps in this way in all cases. This skill can only be obtained by making persistent efforts to secure a good application in every case which comes under observation.

This course is rendered justifiable, moreover, by the fact that the danger of injuring the mother's tissues by moderately prolonged efforts to secure an accurate adjustment is extremely slight so long as the operator is able to restrain himself from yielding to the temptation to overcome obstacles by force. In other words, as long as he remembers that the only possible obstruction to the advance of the blade is that its tip is so directed that it is in unduly firm contact with either the maternal or fœtal tissues, so that there is nothing to oppose its onward movement if it is properly directed, and that the obstacle must be overcome by adjustment of the blade and not by the use of force, he can do no harm. If several such efforts to secure an accurate adjustment to the sides of the head have merely resulted in an oblique application of the instrument, it is allowable in high arrest to proceed with the extraction with the instrument in that position until the head has passed the superior strait, when a re-application should be made.

The forceps will in the meantime be so applied that the anterior blade is in contact with the temporal region, while the lambdoidal suture of the other side is included in the fenestra of the posterior blade. When applied in this position the compressive force of the forceps tends in itself to produce rotation.

The application of the forceps to the head at the superior strait is rarely possible by the direct method, and the indirect method must generally be adopted. The anterior blade is so much the more difficult of application that it is customary to introduce it first in all cases. Its adjustment is then much more easy than if it were complicated by the presence of the shank of the posterior blade in the vagina.

The patient being in position and everything in readiness for operation, the physician should lock the forceps, turn them outside the vulva into the diameter which they are expected to occupy, and then select the blade which is to be the anterior one.

Two fingers of the hand which bears the same name as the position should be passed into the cervix, and should find the point at which there is the greatest space between the head and the symphysis. After the fingers have been passed as high as is possible into this space the anterior blade should be introduced between their palmar surface and the head, and should be passed into position under guidance of their sense of touch. It should then be urged forward

to a situation over the parietal boss by pressure with the internal fingers upon the convex edge of its fenestrated portion. The handle of the blade should then be given to an assistant to hold during the application of the other blade. The fingers of the other hand should then be passed into the cervix, and urged as high as is possible without the use of the forceps into the space between the head and the sacro-iliac notch on the other side. The posterior blade should then be passed into position under their guidance and so adjusted as to lie opposite its fellow.

It must be noticed that in O. L. A. positions this rule leads to the introduction of the right blade first, and that, owing to the construction of the lock of most forceps, it is necessary to introduce the second or left blade behind the shank of its fellow, a proceeding which is much facilitated by temporarily drawing the first handle toward the left thigh of the mother. In O. D. A. positions no such special precaution is necessary, since the left blade is the anterior one.

If the head is already engaged in the superior strait, the only precaution necessary is to avoid the use of any force which might alter its position. If, however, at the time of the operation the head is still freely movable above the brim, it is usually important that it should be held in position by external pressure from the hands of an assistant, in order to prevent the occurrence of partial rotation during the application of the blades.

Should the forceps fail to lock after the application of both blades, the blade which seems to be in fault should be partly withdrawn and gently moved during its re-introduction into a position which corresponds to that of its fellow. In high, even more than in low forceps operations, all attempts at forcible apposition of the blades when in position upon the head is to be unhesitatingly condemned. If the instrument has been successfully applied to the sides of the head the handles will be found in close approximation. If the application is oblique they will be separated by a greater or less interval, in which case the head is always exposed to serious risks of undue compression. If the grasp of the head is such that the handles are separated by more than the amount which will allow a half-inch of approximation of the blades, it is always best, before any traction is made, to insert between the handles a towel folded in such a way that greater compression than this is impossible.

If the original application is oblique the forceps should be removed and readjusted to the sides of the head as soon as it has entered the excavation. As in low operations, the first traction should be gentle, gradual, and tentative, and intended more to test the grasp of the instrument and the possibility of its slipping than to advance the head. When the security of the grasp has been ascertained and serious tractions are begun, they should be directed as far backward as the perineum will allow. The curves of the ordinary

forceps are such, however, that traction in the axis of the superior strait can never be obtained by simple traction upon the handles of ordinary forceps. If axis-traction is not employed it is always best that one hand should be placed upon the shanks of the instrument near the vulva, and should be used to make downward pressure, while the other grasps the handles near their extremity, and exerts traction at an angle of about forty-five degrees with the horizon. By this manœuvre an outward pull is combined with a backward leverage between the hands in such a manner that the resultant of the force employed is as nearly as possible in the desired direction. This effort should be continued until the passage of the head through the superior strait makes the remainder of the extraction a low operation.

FIG. 98.

Pajot's manœuvre. (PARVIN.)

A successful application of this method of traction requires not only a high degree of operative skill, but considerable muscular strength, and the authors believe that the obstetrician who performs a high operation without using axis-traction forceps, when such an instrument is at hand, distinctly fails to offer his patient one of the most important advantages of modern obstetrics. This is the more true since the recent modifications in axis-traction models render them easily amenable to the use of any physician who is qualified to perform any serious obstetrical operation.

Application of Axis-traction Forceps. The application of the modern forms of axis-traction forceps requires little additional description. In Tarnier's latest model, and in Lusk's modification of Tarnier, the traction rods are so shortened as to lie flat against the blades until the application is completed.

With most of the other instruments, however, it is necessary to lift the rod which is attached to the female blade over the handle before locking the instrument. If the Reynolds rods are employed in connection with the ordinary forceps, they may be attached to the fenestræ with the forceps already in position in all but extremely high applications, and even in these the application is usually easy if made before the forceps are locked. Most operators, however, prefer to place the rods in position before the blades are introduced, when the application is exactly similar to that of the Simpson instrument.

When the instrument is in position the transverse bar is attached to the rods, and the handles are grasped and compressed by the hand to the desired degree. The compression screw is then tightened to that extent, but no more, as any approximation of the handles by the use of the screw is always highly dangerous on account of the impos-

FIG. 99.

Axis-traction with plain forceps, operator standing. Pajot's manœuvre. (JEWETT.)

sibility of estimating the amount of force so applied and the ease with which a fatal degree of compression may be exerted. No traction is to be made on the rods unless the handles of the forceps are held in position either by the hand or by the screw, as this would only result in the removal of the instrument.

After a gentle tentative traction to test the grasp of the blades, the traction bar is swept as far backward as the perineum permits, and traction applied to it alone. As the head advances the handles will be seen to rise slowly in the curve of Carus, and their upward movement should be followed by a similar alteration of the line of traction. In operating with the unmodified instrument the French school of obstetricians consider artificial rotation at the brim by the forceps as sometimes justifiable. Most American and German operators, however, think that even the most expert are unwise in permitting

themselves to use any force but that of simple traction while the head is still high, and nothing should tempt the inexperienced accoucheur to permit himself the use of any pendulum movements, or of any attempt at rotation by the forceps, while any part of the head is still within the uterine cavity. If axis-traction rods are used, flexion and rotation of the head take place automatically under the guidance of the mechanical forces of the obstetrical canal, and require no special care on the part of the operator. The only precaution necessary is that the tractions shall be intermittent and that the compression screw shall be released during the intervals.

FIG. 100.

Axis-traction with plain forceps, operator sitting. Pajot's manœuvre. (JEWETT.)

Some operators prefer to complete the extraction with an axis-traction instrument, but the expediency of this course of action is very doubtful. Not only does the special value of these instruments decrease with the advance of the head, and become least at the inferior strait, but the presence of the rods and the greater bulk of most axis-traction models necessarily expose the tissues of the pelvic wall to increased danger of laceration.

In view of these facts, it is usually better to remove the axis-traction instrument when the head reaches the inferior strait, and to complete the delivery with simple forceps.

CHAPTER XV.

VERSION.

THE term version is applied to all operations by which the long axis of the child is changed in its relation to the long axis of the uterus. The operation is divided into three varieties: pelvic, cephalic, and podalic version—each named according to the part of the child which is brought to the inlet of the pelvis by means of the operation.

Furthermore, version may be performed by three methods: the external, the internal, and the combined or bipolar method.

Pelvic Version.

Pelvic version is rarely performed, and then only by the external method. It is indicated in cases in which it is known at the beginning of labor that a breech presentation is desirable, and that some other presentation is present, as in a transverse presentation in a flat pelvis.

After external version has become impossible, internal or bipolar podalic version is generally to be performed.

External Method. Version by the external method should expose the mother to no additional risks, but is liable to be fatal to the child by causing displacement and consequent compression of the cord. It cannot be performed after the presenting part has engaged or after the escape of the waters. The conditions which favor its performance are lax abdominal walls and a condition of free mobility of the child. Under opposite conditions it may be made possible by the free administration of an anæsthetic. If the performance of pelvic version by the external method be determined upon, the bladder and rectum should be emptied as in all obstetrical operations. The patient should be placed upon her back, and the operator should stand by her side facing her. After carefully mapping out the position of the child, he places one hand flat upon the abdomen with its palmar surface as nearly as possible over the sacrum of the fœtus, and the other hand in the same position over its forehead. Then he endeavors by gentle pushing movements of both hands to so change the position of the child as to convert it first into a transverse, and then into a pelvic presentation.

If a contraction comes on during this process all movements of the hands must cease at once, and the operator must direct his whole

attention to the effort of holding what he has gained. Gentleness and patience are essential to success, as hasty or rough manipulations always excite contractions, and so defeat their own purpose. When the breech has been brought to the inlet, it must be held there by the hands, or, if this becomes too tedious, by a properly adjusted binder and compresses, until it has become engaged in the superior strait.

The version may sometimes be aided by placing the patient at the beginning of the operation upon the side to which the breech is turned, for as the fundus sinks to that side it carries the breech with it, and so tends to move the head toward the opposite iliac fossa. The subsequent treatment is that of an ordinary breech case.

Cephalic Version.

Theoretically cephalic version should be performed in all uncomplicated cases of breech or transverse presentations. In practice, however, the operation is limited to cases in which the diagnosis is

FIG. 101.

Cephalic version. Wright's method. (PARVIN.)

made early, in which there are no indications for a rapid delivery, and in which the other conditions are favorable for its performance by either the external or bipolar method; for internal cephalic version is usually more difficult and dangerous than internal podalic version.

External Method. The performance of cephalic version by the external method differs in no way from the description of external version already given under the head of pelvic version. If cephalic version is indicated and the use of the external method is possible, it should always be preferred as being the least meddlesome and dangerous operation.

Bipolar Method. In regard to efficiency, as well as to the possible risks, bipolar version occupies an intermediate position between the

FIG. 102.

Braxton Hicks' method of combined podalic version, first stage. (HIRST.)
One or two fingers of the left hand lift the head from the brim and push it toward the left iliac fossa, while the right hand pushes the breech transversely toward the right side.

internal and external methods. The conditions which make external version possible render bipolar version easy. Moreover, it can often be performed when the external method is no longer possible, and with far less interference with the processes of nature than is necessary to the performance of internal podalic version at an early stage of labor. A moderate degree of engagement of the presenting part makes bipolar version more difficult, but is not necessarily a bar to its employment.

Cephalic version by the bipolar method is usually restricted to cases of transverse presentations in which the liquor amnii has not yet drained away and the presenting part is but lightly engaged.

A prolapsed arm, unless previously replaced, would prevent its performance. Anæsthesia, though not always necessary, is always a distinct advantage in this operation. Of the various methods which have been proposed, only that of Braxton Hicks is ever employed at the present day. After the bladder and the rectum have been emptied the hand which is of the same name as the position (right position—right hand) is introduced into the vagina, and two fingers are passed through the os to the presenting part, which for convenience we assume to be a shoulder. This is gently raised and moved toward the feet by the fingers of the internal hand, care being taken not to rupture the membranes if they are still intact. As soon as the shoulder rises the external hand begins to press the head toward the inlet until it can be received and guided to the os by the tips of the internal fingers. It is retained in its new position by the pressure of the external hand, and the internal hand is removed from the vagina and used, if necessary, to complete the version by making upward pressure on the breech through the abdominal wall, as in external version, or the internal hand may be used to retain the head while the other hand is transferred to the breech. After the completion of the operation the head must be retained in position by external pressure as in external version. If the os is sufficiently dilated the membranes may be ruptured in order to hasten the fixation of the head. The remainder of the delivery is left to nature.

Podalic Version.

Podalic version is indicated in most transverse presentations; in most brow, and many face presentations; and in some other malpresentations of the head when high arrest occurs. It is the operation of choice in some cases of contracted pelves, particularly those of the flat type. It may be performed by either the combined or the internal methods, but is, of course, beyond the power of external version.

Bipolar Method. This operation is not much used in head presentations, because podalic version is now generally followed by immediate extraction, and, therefore, presupposes a degree of dilatation of the os which admits of the introduction of the whole hand. It is of value, however, in some cases of placenta prævia in which there is profuse flowing at an early stage of labor. In such cases it is useful, both because it can usually be completed with less loss of time than is consumed in the preparation of the os for internal version, and because, after its completion, the pressure of the half breech against the os is usually sufficient to control the hemorrhage until free dilatation has been accomplished. It may, however, be used

in any case in which the mobility of the fœtus is unimpaired at the time of operation. Its performance is rendered more easy by the administration of an anæsthetic, which should be given to full surgical anæsthesia. In this country the patient is usually placed in the lithotomy position, in which case she should lie across the bed with the buttocks well over the edge. Each leg should be held by an assistant, and the operator should sit between them. The full observance of all aseptic precautions is as necessary in this operation as in internal version. The exact position of the child and its

FIG. 103.

Braxton Hicks' method, second stage. (HIRST.)
The left hand pushes the shoulder to the left, while the right hand pushes the breech to the right and downward.

extremities is made out by careful abdominal and vaginal examination, and the bladder and rectum are thoroughly emptied. The hand of the same name as the position is now passed into the vagina until two fingers can be inserted for their whole length through the os. The fingers then raise the head and push it gently to the side toward which the occiput is directed, while the other hand pushes the breech by external manipulations in the opposite direction. (Fig. 103.) This process is continued as long as the head remains within reach of the internal hand. The fingers are then moved toward the breech in

search of a knee, which, unless the normal flexion of the child has been lost, will now be easily within reach. (Fig. 104.)

The knee is to be distinguished from the elbow by the fact that it points toward the head, while the elbow points toward the breech. The presence of the patella may also be recognized in some cases, and, if it is found, is, of course, conclusive. If a foot be reached by chance before the knee, and surely recognized, it should be seized at once. The foot is to be distinguished from the hand by the presence of the malleoli and of the prominence of the heel, and by the fact that the great toe is of a length equal to or greater than that of the others, and is in the same plane with them, while the thumb is

FIG. 104.

Braxton Hicks' method. (HIRST.)

The right hand forces the fœtal limb down within reach of the left hand, so that the fingers may be hooked over the knee.

shorter than the fingers, and can be opposed to them. Moreover, the hand often shows a tendency to grasp the examining finger.

It may sometimes happen that the head becomes extended under the pressure of the internal hand, and thus passed out of reach of the internal fingers before the external hand has been able to depress the breech sufficiently to bring the knee within their reach. In this case the fingers next come in contact with the shoulders and chest, which must be urged upward and onward toward the head, while the external hand continues to press the breech down until the knees are within reach. As soon as the knee is recognized the membranes, if still intact, should be ruptured and a finger hooked around

the knee. The hand which has been depressing the breech is then applied to raise the head, while the internal fingers draw the knee to the os. When the knee is fairly in the vagina and under control, the foot should be brought down and examined, to guard against the possibility that an error has been made and an elbow mistaken for a knee. The version is then completed by traction upon the leg in combination with external pressure upon the head. After the completion of the version the treatment is that of an ordinary footling case.

Podalic version by the bipolar method is seldom performed in transverse presentations, for, until it has become impossible, bipolar cephalic version is usually to be preferred. In case it is done, the position at the beginning of the operation is that represented in (Fig. 103), and the procedure is in every way that which has just been described.

Internal Method. This operation differs from those previously described in that its performance presupposes a degree of preparation of the soft parts which permits of an immediate extraction after the completion of the version. If it is preceded by artificial dilatation of the os, it is capable of effecting a rapid delivery in almost all cases, at any stage of either pregnancy or labor. It was formerly regarded as the most generally valuable of all obstetrical operations. Barnes said: "If we were restricted to one operation in midwifery as our sole resource, I think the choice must fall upon turning. Probably no other operation is capable of extricating patient and practitioner from so many and so various difficulties." It is still our main operative resource in eclampsia, placenta prævia, concealed hemorrhage, and many other of the gravest obstetrical emergencies.

Internal version is not, however, an indifferent operation. It exposes the mother to grave dangers, both of injury to the tissues from too rough manipulations, and of the introduction of infection from without. It should not be attempted while the less dangerous methods are possible, nor in any case without full aseptic precautions.

When this operation is to be performed it is a wise precaution to procure the services of a second physician, who shall administer the anæsthetic and assist in the extraction by suprapubic pressure.

Before operating the physician should see that ice, ergot, brandy, a hypodermic syringe, and plenty of hot and cold water are in readiness and close at hand. Several towels and two fillets should be sterilized by immersion in a solution of corrosive sublimate. A similar solution and a nail-brush should be so placed that they will be within easy reach of the operator during the operation. The forceps and catheter should be sterilized and laid at hand. The bed and floor should be protected by rubber sheets, and each leg of the patient should be wrapped in a blanket. If the bed is low it is better to place the patient during the operation on a table covered

with a folded blanket. The rectum and bladder should be thoroughly emptied, and both arms of the operator should be bared and disinfected to the shoulder.

The position of the child should be carefully mapped out by a repetition of the abdominal and vaginal examinations, and its condition ascertained by an auscultation of the fœtal heart. The patient should be fully anæsthetized and placed in the lithotomy position, and each leg should be held by an assistant.

Internal Podalic Version in Head Presentations. Everything being ready for the operation, the hand of the operator of the same name as the position (*e. g.*, O. L. A.—left hand) is thoroughly lubricated with some sterile lubricant, preferably lysol, 1 to 100, or sterilized vaseline, upon its dorsal but not upon its palmar aspect, and, with the fingers formed into a cone, is passed into the vagina. This should be done slowly, and, if the vagina is narrow, by gradual dilatation.

The direction of pressure should be at first backward toward the sacrum, but should turn forward in the axis of the superior strait as the hand enters the excavation. The cervix should be passed with the same care, and the upward movement continued until the palmar surface of the hand embraces the frontal end of the head. From the time the hand enters the vulva, careful counter-pressure on the fundus must be maintained by the other hand of the operator or by a skilled assistant, in order to guard against the danger of rupture of the vaginal attachments of the uterus. The head is raised by gentle and steady pressure in the axis of the superior strait, until it leaves the inlet and glides into an iliac fossa. The hand can then slip by it into the uterus, but all its movements after it enters the cervix must be slow and gentle, and in case a pain comes on, they must cease entirely, and the hand must be flattened and remain passive while the contraction lasts, as any motion of the hand during a contraction may result in rupture of the uterus.

The hand should now be passed toward the fundus, in search of a foot. As it passes the child's thorax it is likely to come in contact with the fœtal hands, and, as the feet may exceptionally be extended into the same region, any extremity which is touched must be carefully examined and its character determined by the diagnostic points already mentioned.

If, as is usual, the hand reaches the middle of the body, without detecting a foot or knee, it should next search for the cord, both to obtain exact information as to the condition of the child, by noting the rate and regularity of its pulsations, and in order to make sure that it is not twisted or looped about the child's limbs or body in such a way that it is likely to be compressed or broken during extraction. If the cord is found in such a position it is to be gently disengaged and placed by the side of the child out of harm's way.

Observance of this precaution will repeatedly give reason for the operator to congratulate himself on not having neglected it. When a foot has been reached and recognized as such it should be grasped either by encircling the ankle with the thumb and fingers, or, better, by seizing the metatarsus with the second, third, and fourth fingers, while the forefinger and thumb encircle the projection of the heel behind the ankle (Fig. 105), which thus lies between the first and second fingers; or a finger may be hooked into the flexure of the knee if this be accessible. The hand, with the enclosed foot or knee, is then gently withdrawn into the vagina.

A handle for traction having been secured in this way, the external hand is withdrawn from the fundus and placed over the head, and the child is turned by traction upon the foot in the vagina, in combination with upward pressure on the head through the abdominal wall.

FIG. 105.

Method of grasping foot.

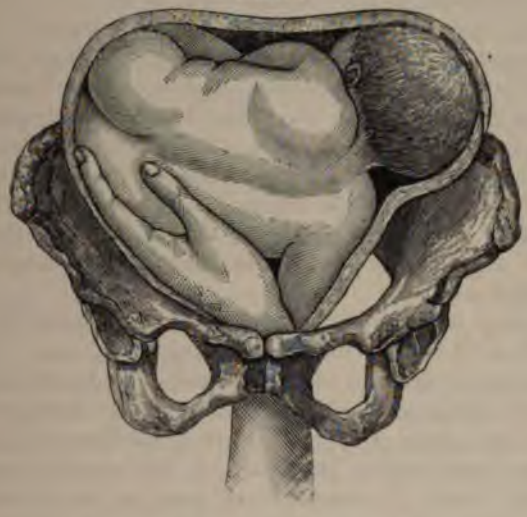
The version is complete when the knee appears at the vulva, the head is felt at the fundus, and the examining finger finds the half breech at the os.

INTERNAL PODALIC VERSION IN TRANSVERSE PRESENTATIONS. This operation differs from internal version in head presentations only in the choice and method of introduction of the hand, in the frequent occurrence of a prolapsed arm, and in the method of raising an impacted shoulder.

In raising the shoulder it is necessary to remember the mechanism of the method by which nature deals with a neglected transverse presentation — that of spontaneous evolution. In this process the trunk enters the pelvis at the brim in an oblique diameter, but as it is forced further down the shoulder rotates to the front and becomes fixed there, while the thorax and abdomen are crowded into the posterior portion of the pelvis by flexion upon themselves. Now, as long as the position is still oblique, and if flexion of the trunk has not begun, the presenting part may be easily raised by pressure upon the shoulder in the axis of the superior strait. As soon, however, as the shoulder has rotated to the front and the thorax has entered the pelvis it is essential that the process of relieving the impaction should begin by the return of the part which entered last—*i. e.*, that portion of the thorax and abdomen which still lies opposite the sacro-iliac synchondrosis. No pressure must be exerted upon the shoulder itself until the trunk again occupies an oblique position. It will be readily seen that this process of unlocking an impaction is by a direct reversal of the mechanism of spontaneous evolution. Of course, during this whole process the most careful counter-pressure must be maintained at the fundus of the uterus.

In simple cases a prolapsed arm may be used as a convenient handle by which to push up the shoulder, and in all cases it is well to begin the operation by noosing a fillet around the prolapsed wrist.

FIG. 106.



Searching for a foot in transverse presentations.

FIG. 107.

FIG. 108.

This serves a double purpose. It may be used at first to draw the arm out of the way of the operating hand; and, secondly, during the

process of extraction slight traction on the fillet will prevent that arm from becoming extended, and thus greatly facilitate the delivery.

Care must be taken, however, to remove the noose as soon as possible, for cases are on record in which sloughing of a hand has followed the too prolonged or violent use of a fillet.

In searching for a foot two methods may be used. The hand which corresponds to the position—*i. e.*, right position, right hand, etc.—may be passed along the back, and over the buttocks to the thigh and leg (Fig. 106), or the other hand may be passed across the abdomen and directly to the feet. (Fig. 107.) The first is the surest way, and should, as a rule, be preferred, but the latter method is often the easier, especially in abdomino-anterior positions.

When the foot has once been reached the remainder of the operation differs in no way in easy cases from that already described under Head Presentations.

Much has been written on the advantage to be gained by selecting the superior foot in version for transverse presentations. This view, however, has never obtained much credence outside of England, and since the latest British authority, Galabin, not only disapproves of this practice, but has given a very convincing mechanical proof of the fallacy of the theory which prompted it, the subject requires only casual mention here. Unless special care be taken to select the superior foot the lower is almost invariably seized.

Difficulties and Complications of Internal Version.

The difficulties encountered in version are usually due to one of three conditions which are: the presence of an imperfectly dilated and rigid os; partial impaction of the presenting part; or the clasping of the child either generally by a dry and retracted uterus, or locally by a spasmodic hour-glass contraction, a constriction ring.

Rigid Os. When version is indicated in the presence of a partially dilated or rigid os, it must usually be preceded by an operative dilatation of the cervix, by one of the methods described in Chapter XIII.

If this operation is to be followed by version, the dilatation should be carried to the highest degree which is possible before turning is attempted, in order to minimize the danger of a reclosure of the os about the neck during the extraction of the child.

Partial Impaction. A well-fixed head, already deeply engaged, is usually a case for forceps rather than version. There are, however, some cases of arrest due to an extended head or to brow presentations, which are unsuitable for forceps and must be treated by version. In these cases it is essential that flexion should be restored by pressure upon the forehead before any attempt is made to raise the head, for not only is the return of an extended head, as such, a practical

impossibility, but the restoration of flexion usually unlocks the impaction, and makes subsequent return of the head an easy matter.

The treatment of a partially impacted shoulder has been described already. It only remains to say that in a marked case the operation is always dangerous, and should never be undertaken except in the interest of a fairly vigorous child, since it is always so protracted that there is but a small chance of saving a child whose vitality has already been seriously impaired, while decapitation offers a much safer means of escape to the mother.

Bandl's Ring. The performance of version in the pres nce of a Bandl ring requires even greater gentleness and caution than are necessary in other cases, and careful counter-pressure over the fundus is of even greater importance. Apart from this it presents no special difficulties.

Constriction Ring. The presence of a constriction ring, on the other hand, is frequently the cause of some of the most troublesome of the difficulties met with in version.

If the hand, after passing the head, finds itself opposed by such a ring, the question of abandonment of the operation at once arises. If the ring is so tight that even the fingers fail to pass it without dilatation, this question must usually be answered in the affirmative.

If, however, the fingers pass, and for any reason it is decided to persist in version, the ring should be gradually and carefully dilated by the hand in the same manner as a rigid os until it permits the passage of the hand, after which there is usually no difficulty in drawing a foot into the vagina. Before the foot reaches the vulva, however, its progress is likely to be arrested by the engagement of the occiput in the ring, which now clasps the body of the child with the occiput caught below it, and the half breech above and to the other side. No progress can now be made until the ring has been sufficiently dilated to permit the escape of the occiput from beneath it, and any attempt to overcome the obstacle rapidly and by force must surely result in rupture of the uterus.

The first attempt at release should be by steady, gentle traction on the foot, which, if prolonged for some moments may gradually overcome the resistance of the ring and dilate it to an extent which will permit the occiput to pass the ring, after which the breech slips easily through. If this fortunate result does not occur, the operator must turn to other expedients, the best of which for this case is usually the following: a fillet is noosed around the foot, and, while the disengaged hand makes gentle steady traction upon this, the hand which was before external is passed into the uterus, grasps the occiput in its open palm (Fig. 109), and by a gentle pushing movement attempts to lift it past the obstacle and into the upper part of the uterus.

More may be gained in some cases by repeatedly alternating traction upon the foot with upward pressure upon the head. Neither of

these manœuvres, however, should be undertaken except in the presence of a trained assistant who is capable of making efficient counter-pressure on the fundus. When the ring is situated around the child's neck, the above expedient is usually the most effective, and if persisted in will rarely fail. Occasionally, however, it may be better to replace the foot above the ring after the application of its noose, and thus lessen the tension on the ring before attempting to push up the head with the hand. In this case the disengaged hand should be used to press the breech downward, as in bipolar version. This method, however, though sometimes useful, is, on the whole, less efficient than the preceding, and, moreover, exposes the utero-vaginal attachments to somewhat greater risk of laceration.

FIG. 109.

Version in presence of a constriction ring.

If the ring is situated higher in the uterus and grasps the breech or body of the child, the foot often comes readily to the vulva, but recedes into the upper part of the vagina as soon as it is released. In such a case it will be found that the fundus turns to one side and descends with the breech into the lower part of the abdomen, but returns to its erect position with the enclosed breech as soon as the foot is released. This difficulty is generally best met by the introduction of the hand and the withdrawal of the other leg, after which traction on both legs will usually release the breech.

This expedient is also often of value when a child refuses to turn

on account of general rigidity of the uterus, and in the absence of a constriction ring.

General Retraction of the Uterus. Version is rarely performed in head presentations in a dry and generally retracted uterus, but as this retraction is in effect merely a combination of the two preceding conditions in a dry uterus, it would be met by the expedients just described if version were decided on. In transverse presentations, however, version is the only conservative operation possible, and it must occasionally be attempted even in the presence of a high degree of retraction.

In such a case, if the child refuses to turn when the traction is exerted on a single leg, the second leg should be withdrawn, and traction should be made alternately on one or the other, or both legs.

FIG. 110.

If simple traction fails it should be supplemented by upward pressure on the presenting part, employed either in alternation or coincidently with the traction, and by the use of a fillet, as described above.

In some cases of completely transverse presentations, success may be attained after the failure of the preceding methods by the application of the following manœuvre: A noose is placed around both feet, and the hand which corresponds with the breech is passed within the uterus and its palmar surface applied to the breech. An assistant then makes counter-pressure on the head in the direction of the breech, while the operator's external hand makes traction on the feet, and his internal hand presses the breech toward the head. (Fig. 110.)

The child is thus doubled upon itself, and the breech is brought into the lumen of the inlet by flexion of the abdomen upon the chest, and as soon as the breech has fairly entered the superior strait the head will rise spontaneously to the fundus, or may be assisted to rise by gentle external pressure. This method, however, is not without its risks to the uterus, and undoubtedly exposes the viscera of the child to some danger of injury from compression.

Indications for Version.

Version may be performed in any case of head presentation in which speedy delivery becomes necessary in the interest of either mother or child before the head has passed the brim, as in eclampsia, placenta prævia, concealed hemorrhages, prolapsed cord, etc. It may sometimes be indicated when a brow, or a posterior position of the occiput or face is arrested at the brim of the pelvis; it is the operation of choice in head presentations complicated by prolapse of an arm or foot; and in contracted pelves of the flat type unless the greatest diameter of the head has already passed the conjugate of the brim. It is the only conservative operation which can be performed in transverse presentations. It will occasionally succeed in head presentations after an attempt to extract by forceps has failed.

Contraindications.

Version should never be performed in a justo-minor pelvis, except in transverse presentations, unless the contraction of the pelvis is very slight, or the child is known to be small, as in operations for eclampsia, placenta prævia, etc., before term. Version should never be performed on the first of twins unless it is transverse, or upon a child known to be dead, except under very favorable circumstances.

In cases of general retraction of the uterus or of constriction ring, version should be performed only when the child is in good condition and no other conservative operation is possible, as in transverse presentations.

Until a comparatively recent date version was considered the most valuable of all obstetrical operations, but not only the fact that its performance, even by good operators, is attended by a considerable fœtal mortality, but the constantly increasing list of fœtal injuries laid to its charge, especially spastic paralyses developing even as late as two years after birth, stamp it as a distinctly dangerous operation; and the consensus of opinion to-day is that its use should be restricted to cases in which the most rapid delivery possible is indicated, and to those in which the other conservative operations have failed.

CHAPTER XVI.

THE DESTRUCTIVE OPERATIONS.

CRANIOTOMY, DECAPITATION AND EXENTERATION.

Embryotomy. The term embryotomy properly includes all the operations whose aim is to reduce the bulk of the child in order to decrease the risks of injury to the mother during its extraction—that is, craniotomy, decapitation, and exenteration.

It may become necessary to perform any one of these operations either before or after the death of the child. The responsibility of the decision to sacrifice the life of the child in the interests of the mother is so great that it should never be undertaken without a formal consultation. Even when the child is known to be dead, care for his own reputation should induce the physician to demand this protection.

Before the performance of any such operation the father at least should always be informed of the circumstances of the case, and if the necessity for such an operation arises before the death of the child, it is always proper that the mother as well should be given a full opportunity to avail herself of any religious advice she may desire, before giving her consent to the destruction of her child in preference to the alternative of the performance of an abdominal delivery, if this is still possible, to save her own life. The use of ether, though not always necessary to a proper performance of the operation, should always be resorted to in common humanity to the mother, that she may be spared all recollection of the actual details.

It may be laid down as a definite rule at the present time that no destructive operation should be performed on a living child, unless the mother absolutely refuses to submit herself to the risks of an abdominal delivery, or her condition is such that the performance of an abdominal delivery for the sake of the child will probably result in the sacrifice of her life for that of the child.

CRANIOTOMY.

Indications for Craniotomy. During the life of the child craniotomy is to be performed only when the ordinary conservative operations are impossible, or when they are so dangerous to the mother, and give so little promise of saving the child, that they are considered unjustifiable. Since the introduction of the modified Cæsarean sec-

tion has been attended by such wide-spread success, it may be stated as a fixed principle that a living child should never be perforated, unless the section is contraindicated or absolutely refused by the patient. After the death of the fœtus craniotomy should be theoretically the preferable operation in all head cases in which interference is necessary. The popular prejudice against mutilation of the child is so great, however, that craniotomy is ordinarily restricted to cases in which delivery by forceps or version promises unusual risks to the mother.

Craniotomy may be performed on either the fore-coming or after-coming head. The operation is divided into three stages: perforation of the skull, evacuation of its contents, and the extraction of the head.

Instruments. The instruments which may be employed in the operation are the craniotomy scissors or trephine, the craniotomy forceps, and a variety of extractors. The choice between the scissors and trephine is mainly one of convenience to the operator. The trephine makes a neater, larger, and more regularly-shaped hole in the skull, but its complicated construction makes it an extremely difficult and very tedious instrument to clean. Moreover, its bulk makes it very inconvenient for use on the after-coming head. It is an almost obsolete instrument. The scissors make an irregular hole that is frequently surrounded by small spiculæ of bone, which, if not removed, may prick or tear the fingers of the operator, or the maternal tissues. It is otherwise a convenient instrument and one which is readily cleaned. It is as easily used on the after-coming as the fore-coming head, and is, therefore, generally preferred, since craniotomy is relatively so rare that few physicians care to equip themselves with an unnecessary number of instruments for its performance. The best form of craniotomy scissors is that invented by Simpson and shown in Fig. 112.

The craniotomy forceps are merely a large and strong pair of curved bone forceps, such as are used in surgical work, and are useful in reducing the size of the skull by removing the bones piecemeal in difficult cases.

Extraction may be performed by the use of the crochet, blunt-hook, or cranioclast, or cephalotribe, but should never be attempted with the ordinary obstetrical forceps. The blunt hook and crochet are old-fashioned instruments, which take such an uncertain hold upon the skull, and are so liable to slip and injure the maternal soft parts, that they have or should have become wholly obsolete. Braun's cranioclast, or as it has been aptly termed by Mundé, craniotractor (Fig. 115), is the only instrument which is capable of affording an absolutely secure grasp upon the skull, and, moreover, when properly used, it is practically incapable of injuring the mother's tissues. The latter advantage is due to the fact that one blade is within the cranial

cavity, while the other is almost completely buried in the soft tissues of the scalp.

The cephalotribe is in effect a large and powerful pair of obstetrical forceps furnished with a compression screw, and intended to crush the

FIG. 111.

Smellie's scissors.

FIG. 112.

Naegele's perforator.

FIG. 113.

Martin's trephine.

FIG. 114.

Crochet.

FIG. 115.

Braun's cranioclast.

head, and thus reduce its bulk by external pressure. It was originally thought that the head could be crushed and subsequently extracted by a single application of the instrument, but it has been

found that those cephalotribes whose cephalic curves were slight enough to admit of their effectually crushing the skull, are by that very fact rendered liable to slip. The cephalotribe is a clumsy instrument, and is used to-day, if at all, only for the purpose of crushing an already perforated head, as a preliminary to the removal of the cranial bones piecemeal by craniotomy forceps.

Craniotomy to the Fore-coming Head. PERFORATION. Two fingers or the half hand should be passed to the head, behind the symphysis, with their palmar surfaces downward. The scissors

FIG. 116.

Perforation of the skull.

should be passed along the fingers, and adjusted by their tips to a position in which the axis of the point is perpendicular to the portion of the skull against which it impinges, or is directed slightly toward the hand. The latter position is the better, because in case the instrument should slip, it may be arrested by the fingers instead of burying itself in the vaginal wall or uterus.

The surface of one of the flat bones should be chosen for perforation, rather than one of the sutures or fontanelles, as the hole is less liable to be lost when the instrument is removed. The perforator is

forced against the bone by carefully guarded pressure, accompanied by a slight boring motion, and is passed through its substance until its progress is arrested by its projecting shoulders. The catch which holds the handles apart should then be loosened, and the blades separated to the widest possible angle. They should then be closed and rotated to a position at right angles with the first, again widely opened, and, while still extended, rotated in all directions, in order to convert the hole into the largest aperture possible.

If the trephine is preferred, it is best to choose one which is furnished with a pelvic curve. It should be passed to the head under the guidance of the fingers, and throughout the perforation its position should be watched by one hand of the operator, the other steadying the shaft of the instrument, while an assistant turns the crank.

The scissors, or, if the operator prefers, some smaller instrument, should next be passed into the head until it comes in contact with the base of the skull, and if possible into the foramen magnum, and should be swept around in all directions in order to thoroughly break up the cerebral centres of organic life. This is done for the reason that it is important to effectually destroy the life of the child before its delivery, in order to avoid the very unpleasant accident of the birth of a perforated but living child.

EVACUATION OF THE BRAIN. In cases where the pelvis is so extremely contracted that the head must be reduced to the least possible size before its extraction, it is well to empty the cranial cavity by washing out the brain with a large stream of water injected into the interior of the skull with a syringe through a large catheter or some similar apparatus. In the majority of cases, however, this precaution is unnecessary.

EXTRACTION. After the base of the brain has been thoroughly broken up, one finger of the operator should be inserted into the aperture in the skull before the scissors are withdrawn. The neglect of this precaution may sometimes result in considerable difficulty in finding the site of the perforation. The solid or male blade of the cranioclast should then be passed through the perforation and its handle steadied by an assistant. The female blade should then be adjusted over the external aspect of the head. In vertex presentations this blade should be applied, if possible, to the face of the child, which is not only the most solid of the accessible portions of the skull, but is furnished with soft tissues in greater abundance than is the scalp, and, therefore, makes possible a more efficient burying of the external blade in their substance. Should want of space prevent this application, the blade should be adjusted to a position over some portion of the occiput, since this is the only other portion of the skull which affords a solid grasp for the cranioclast. The male blade should then be so rotated as to permit the locking of the instrument,

and the handles should be brought into close approximation by a forcible use of the compression screw. Steady, persistent traction will now usually result in an advance of the head, which is immediately signalized by the oozing of brain substance through the hole in the skull. During the whole extraction the operator's fingers should be kept in the vagina and should watch the edges of the perforation, to prevent any tearing of the maternal tissues by projecting spiculæ of bone. Throughout the extraction the operator should so apply his force, that it may be promptly relaxed whenever the tissues grasped by the cranioclast are felt to be giving away, and thus prevent accidents to the maternal tissues from the slipping of the instrument. If at any time the tissues begin to give way, the external blade should be removed and a fresh application made.

Difficult Extraction. If the pelvic space is markedly small as compared with the individual skull, it may be necessary to diminish the bulk of the head by deliberate tearing away of the cranial bones before the extraction is attempted. This may be done by the cranioclast under the guidance of the finger, but better with the craniotomy forceps, with one blade between the scalp and the skull, and the other blade inside the cranial cavity, when by a twisting movement under the guidance of the finger, the bones may be successively broken off and removed piecemeal until nothing is left but the face and the base of the skull. The soft tissues of the cranial vault should be left as nearly intact as possible, in order that they may act as a protection for the ragged edges of bone which might otherwise inflict injury upon the vagina or lower uterine segment.

The head should then be manually extended until the face presents at the brim, when the solid blade may be introduced into the mouth or below the chin, and the other blade applied over the forehead. The blades should now be forcibly approximated by the compression screw until their outer edges are separated from each other by but little over two inches. Since the width of the base of the skull rarely exceeds three inches, it is evident that by this manœuvre the perforated head may be extracted through all but the most extremely contracted pelves. If, after such an operation it proves difficult to engage the shoulders in the superior strait, the craniotomy scissors should be passed into the thorax through the supraclavicular space, and followed by the cranioclast, which should take its grasp over the upper portion of the spinal column. In extreme cases of pelvic contraction, it may be necessary to precede the extraction of the body by a preliminary evisceration or by amputation of the arms at the shoulder-joint. The method above described is usually to be preferred in difficult extractions after craniotomy, but it may be sometimes advantageously replaced by the process of crushing the base of the skull after perforation and the evacuation of the brain have been accomplished. The best forms of cephalotribe are those of Hicks,

Blot, and Lusk, but this instrument is rarely found except in the hands of specialists engaged in large consultation practice, who need no directions about its use. Its employment is, moreover, so seldom advisable that further discussion of it in this book is unnecessary.

Extraction of the perforated child by version and manual delivery of the after-coming head is occasionally recommended as preferable to the use of the cranioclast. This is, however, an unsafe operation, the objections to it being that craniotomy is seldom or never to be performed while the uterus is in a condition which renders the performance of version a matter of indifference to the interests of the mother, and that this operation must always expose the maternal tissues to a considerable risk of injury from the broken cranial bones during the passage of the head along the uterine wall.

It is a convenient precaution in every craniotomy to place a pail partly filled with water upon the floor beneath the patient's buttocks, to receive the usually large amount of blood and brains which pour forth from the vulva. The child should be dropped into this head downward as soon as it is delivered, and thus the distressing possibility may be avoided of the child's crying in case the brain has not been thoroughly broken up. Although the perineum is often necessarily lacerated during the performance of very difficult craniotomies, its preservation is with care ordinarily possible, and the importance of this should never be forgotten. After delivery it is usually best in all cases, except where the application of the blades has been made over the face, to so arrange a cap over the child's head as to render it presentable, and thus prevent unnecessary shock to the feelings of the family—a precaution which should always be recommended to the nurse by the physician.

Craniotomy to the After-coming Head. If, after version or the extraction of a breech, the after-coming head is found to be so firmly arrested as to resist all reasonable efforts toward its delivery by the usual methods, the performance of craniotomy is our only resource.

When this becomes necessary the body of the child must be drawn strongly downward toward the floor by an assistant, in order to bring the occiput within easy reach. Two of the operator's fingers are then passed up to the head behind the symphysis pubis. The craniotomy scissors are guided up to the occipital bone between the fingers and the head, and driven through it, while the maternal tissues are effectually protected by the fingers.

The operation is ordinarily extremely easy, and the only special precaution to be observed is that care should be taken to see that the point of the scissors has actually reached the occiput before it perforates the skin, in order to avoid the long tortuous canal which necessarily follows the passage of the perforator through the tissues of the neck and throat, through which the cerebral substance escapes with much less ease. The extraction of the diminished head may

often be now accomplished by the application of combined traction to the face and shoulders in the usual manner, but unless this effort is at once successful the cranioclast should be placed in position over the most accessible portion of the cranial vault and used for supplementary traction. It rarely happens that a pelvis which is roomy enough to allow an intact body to pass through offers any excessive resistance to the perforated head.

Fig. 117.

Craniectomy.

Craniotomy in Face Presentations. In face presentations the perforation should be made through an orbit or through the frontal bone. If an orbit is selected, great care must be taken to pass the perforator well within the cranial cavity before the cranioclast is applied.

Craniectomy. Many complicated instruments have been devised for lessening the bulk of the head by the removal of portions of the base of the skull. If this procedure is necessary, however, it can be equally well accomplished by passing the chain of a powerful écraseur, or the wire of the author's decollator, under the chin of the child and around the head to the edge of the small fontanelle. (Fig. 117.) The adjustment of the noose is effected either by carrying it upward over the face on the tips of the fingers or by the use of a porte-fillet. On tightening the wire the whole face and base of the skull are separated from the rest of the head.

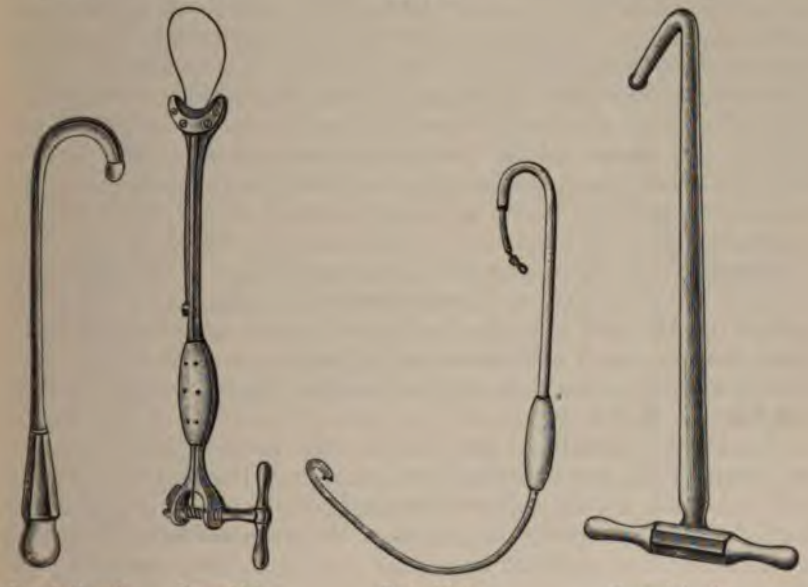
DECAPITATION.

Indications. *Instruments.* The only class of cases in which decapitation of the child is ever indicated is in long-neglected presentations of the shoulder, which have resulted in a condition of extreme impaction. Such cases are only likely to arise in the practice of untrained midwives, and, therefore, they are very rare in this country. The steps of the operation are the division of the neck, the extraction of the body, and the extraction of the head. It may be performed by means of Braun's decapitating hook, Ramsbotham's knife, Reynolds' sharp écraseur, or, in case of necessity, by an ordinary écraseur or even with a stout pair of scissors.

Ramsbotham's knife (Fig. 118) should not be made of very highly tempered steel, since a blunt edge is quite sufficient for the division of the soft fœtal tissues, and a very fine and brittle edge is certain to break against the bones. Reynolds' decollator (Fig. 119) is, in effect, a large and powerful écraseur, the distal extremity of which terminates in a crescentic chisel edge, which, under the traction of the wire

loop, is readily forced through the tissues of the neck. The pressure and counter-pressure are applied to opposite surfaces of the child, so that the use of this instrument exposes the tissues of the mother to no additional strain. It is accompanied by a modification of Ollivier's porte-fillet (Fig. 120), intended to assist in the adjustment of the wire around the neck. Braun's hook (Fig. 121) should be made with a metal handle, as, indeed, should all obstetrical instruments, since the wooden handle with which it is occasionally provided is very liable to split during its rotation.

FIG. 118. FIG. 119. FIG. 120. FIG. 121.



Ramsbotham's knife. Reynolds' decollator. Porte-fillet. Braun's hook.

TECHNIQUE. Decapitation should, whenever possible, irrespective of the instrument to be used, be preceded by the extraction of an arm. If an arm is already prolapsed, it should be secured by a fillet and drawn by an assistant strongly downward and toward the side on which the breech lies, in order to sink the shoulder as deeply in the pelvis as possible, and render the neck more accessible.

Braun's Hook. Braun's hook is an effective instrument, but it has several disadvantages. The division of the soft parts by its use is a prolonged and tedious operation, during which the already over-strained soft parts of the mother are subjected to considerable force from the friction of the child against them during the traction and torsion incident to the operation.

The technique of its use is as follows: The bladder should first be emptied with especial care, for in this operation any urine remaining in the bladder exposes it to increased risk of injury. The hook should then be passed under the guidance of the finger behind the neck and turned forward until it is in position about the neck with its tip forward. The tip should now be protected by the finger and the hook drawn strongly downward and rotated toward the child's shoulder until its tip is buried in the soft tissues.

Now, while strong traction is made upon the handle by both hands of the operator, the instrument should be sharply rotated through an arc of 180 degrees, when the neck will be heard to snap. If the manœuvre fails at first it should be repeated until the neck is broken. The bladder is protected from injury during this procedure by the fact that the point of the hook is already buried in the fœtal tissues, and, moreover, the final turn carries it still further away from the bladder. The soft parts are then divided by torsion, the instrument being drawn firmly downward and rotated until the neck is completely torn away. Throughout this process one hand must be held in the vagina, to guard its tissues from injury which might result from a sudden yielding of the neck.

Ramsbotham's Knife. This instrument, though much superior to the hook in the division of the soft parts of the neck, which it accomplishes rapidly, and under the application of but little force, has the disadvantages that it is liable to break against a vertebra, or to cause considerable delay and annoyance in case an intervertebral notch is sought for.

The knife is introduced between the neck and symphysis, so that when settled into position its point is away from the bladder. When it is in position around the neck its tip should be met by a finger and carefully guarded during the process of dividing the cervical tissues, which is now accomplished by a gentle sawing motion combined with downward traction.

Combined Operation. The disadvantages of the hook and knife are such, that if the operator possesses both, they can be used to much better purpose than either alone, and the preferable method in this case is to break the neck by means of the hook, and after its withdrawal, to effect the division of the soft parts by means of the knife.

The Knife Écraseur. A loop of No. 18 piano wire is drawn into position around the neck by a stout threaded catheter, or by the porte-fillet supplied with the instrument. The ends of the wire are then secured to the écraseur, and the operator satisfies himself that no maternal tissues are included in their grasp. The wire is put slightly on the stretch, the fingers of the operator's left hand cover the points of the instrument, and his right hand guides the handle, while an assistant draws the instrument into position by turning the

crank at the lower end. When the instrument is in position, the division of the neck is accomplished in a few seconds by further turning of the crank without the application of any force whatever to the tissues of the mother.

In the absence of special instruments, the vagina should be distended by a large Sims speculum, a stout cord should be passed around the neck, and drawn as far downward as possible under the guidance of the eye. The tissues may then be cautiously divided with a pair of long stout scissors, continuous traction being maintained on the cord throughout the operation; or, after the passage of the cord around the neck, the vagina and cervix may be protected by the insertion of a large cylindrical speculum, the end of which should be placed against the neck, and the head may be separated from the shoulders by a to-and-fro sawing traction upon the ends of the cord.

Extraction of the Body. After the decapitation has been effected the extraction of the body and the head of the child must be accomplished. The prolapsed arm offers an efficient handle for use in extracting the body. The cut surface of the neck should be protected by covering it with the palmar surface of the fingers in order to obviate all dangers of laceration of the vaginal walls by projecting fragments of bone. The body of the child may now be readily withdrawn by traction upon the prolapsed arm.

Extraction of the Head. After the body has been delivered the head remains in utero and must be removed. This may be accomplished by the forceps, cephalotribe, or cranioclast. The head is turned into a position in which the divided vertebræ occupy the centre of the lumen of the vagina, and extracted with whatever instrument has been chosen, care being taken to prevent any rotation which would bring the divided vertebræ into contact with the soft tissues of the mother.

EXENTERATION.

In transverse presentations where the neck is so high as to be out of reach, and in delivery of the fore-coming body where the disproportion between the child and the pelvis is unusually extreme, it may sometimes be necessary to reduce the bulk of the body by removal of the abdominal viscera before extraction is possible.

This should be done by incising the abdominal walls with scissors, passing the hand through the wound and tearing out the liver and intestines. A finger should then be passed through one of the natural openings in the diaphragm, and made to tear through its substance, after which the heart and lungs can be removed from the thorax. If it should happen in a transverse presentation that the chest only is accessible, the ribs should be cut with scissors, and

care should be taken that their projecting edges are covered during extraction by the intervention of the soft parts.

Extraction after Exenteration. In transverse presentations, after the evisceration is complete, the half hand or the blunt hook should be forced through the tissues of the back and hooked around the vertebral column, or the cranioclast may be applied to it if a good hold can be obtained. Direct traction is then applied, with the result that the lessened body is bent upon itself as the extraction proceeds. While this method will have to be depended upon in perhaps the majority of cases, the performance of internal podalic version is to be preferred if the space gained by evisceration is sufficient to permit the introduction of the hand into the uterus, and the performance of the operation without the use of undue force.

CHAPTER XVII.

THE MAJOR OPERATIONS.

CÆSAREAN SECTION. EXTIRPATION OF THE PREGNANT UTERUS. SYMPHYSIOTOMY.

Cæsarean Section. The Cæsarean section is the operation of removing the fœtus from the mother by opening the abdomen and incising the uterus, the operation being completed after the delivery of the child by the closure of the uterine incision by suture and the closing of the abdominal wound.

Extirpation of the Pregnant Uterus. This operation differs in no way from Cæsarean section up to the point at which the child is removed, but when this point has been reached, the uterus, instead of being sutured and returned to the abdomen, is either amputated at the cervical junction, or completely removed, according to the indications present in the individual case.

Symphysiotomy. Symphysiotomy is the division of the pubic symphysis. Its object in obstetrics is the enlargement of the pelvic cavity in order to facilitate delivery in narrow pelves.

All of these operations date back to decidedly ancient times, but the frightful maternal mortality which attended their performance led to their practical abandonment. Although they have until a comparatively recent date been classed among the obsolete obstetric procedures, the recent advances in surgical technique, together with a more definite appreciation of the indications for them and of their limitations, have restored them to a well-deserved position among the most valuable procedures of operative obstetrics.

Indications for the Major Operations. The performance of one of the major operations is indicated in three classes of cases: 1. Those cases which present what is known as the absolute indication. 2. In the interests of the child during the life of the mother. 3. In the interests of the child after the death of the mother.

1. In the first class of cases are included those which present such extreme degree of obstruction of the pelvic canal that delivery of the child, even after the performance of a craniotomy, is impossible.

2. In the second class are included those cases in which the pelvic obstruction is such that the delivery of a living child is impossible, or extremely dangerous, but in which a delivery after craniotomy is possible. This indication is present in most cases of deformity of

the bony pelvis in which there exists marked disproportion between the fœtal head and the pelvic diameters; whenever the parturient canal is obstructed by malignant disease of the cervix, or by immovable, benign, intrapelvic tumors; and, very exceptionally, in cases of extreme atresia of the vagina. The question of the advisability of abdominal delivery in cases of placenta prævia is at present *sub judice*, and must be settled by future experience.

The performance of the cutting operations in cases in which delivery is obstructed by a tumor, or by any obstacle except bony deformity of the pelvis, must be considered in the discussion of those conditions, and, therefore, this chapter will be devoted to a general consideration of the cutting operations when indicated by bony deformity of the pelvis, special indications due to the form or degree of deformity being also considered in the chapter on contracted pelves.

When it has been decided after a careful consideration of the conditions present in the individual case, in accordance with the principles defined in the section on contracted pelves, that a major operation is indicated, the next point to be decided is, "Which of the major operations is to be performed?" The choice between the different operations must be made by a consideration of the mortality and morbidity of the different operations under the conditions which exist in the individual case, and by a determination of whether the case is to be classed among the favorable or unfavorable cases for the abdominal operation.

The favorable cases for the performance of a major operation may be briefly described as those in which the mother shows no signs of exhaustion from the labor which she has already endured; in which no suspicion of uterine infection is present; and in which no intercurrent disease exists. The reverse of any of these conditions relegates the case at once to the unfavorable class of cases.

In order to emphasize the fact that such a distinction between the favorable and unfavorable groups of cases must be made, a glance at the following statistics is instructive. Everke reports 35 cases of Cæsarean section, followed in a certain proportion of cases by extirpation of the uterus, though his report does not permit of distinction between the cases in which extirpation was performed, and those in which it was not. Of these 35 cases, 10, or about 31 per cent., died. Of the 35 cases, 6 were moribund at the time of operation, 4 were already infected, and 1 died of hemorrhage after the performance of total extirpation. In other words, 11 of the 35 cases belong to the unfavorable class of cases, and of these 11 patients 10 died, while of the 24 favorable cases all recovered. Leopold reports 100 cases, with a mortality of 10 per cent. Of the 100 cases, 29 were subjected to Porro's operation, and 21 others were already infected at the time of operation or had been in labor over twenty-four hours, so

that only 50 cases belonged to the favorable class of cases and had a simple Cæsarean section performed on them. There were two deaths among the 50 favorable cases, but both of these operations were performed more than a dozen years ago, and both patients died of septic peritonitis due to infection at the time of operation from some technical slip in the asepsis of the operation, a danger which modern methods have almost wholly eliminated. On the other hand, 5 deaths occurred among the 21 unfavorable cases, 24 per cent. To the 74 favorable cases included in the reports just quoted the authors add their own cases, 26 in number, all of which belong to the favorable class of cases, and which gave no mortality. There was thus no death among 100 favorable cases except 2 somewhat antiquated cases of imperfect asepsis, while the unfavorable cases reported by Leopold show a mortality of 1 in 4, and Everke's an overwhelming death-rate. There can be little doubt after a careful study of these figures, but that Cæsarean section, performed on favorable cases, is an operation which is attended by a very insignificant mortality, to say the least, nor that in the unfavorable class its mortality is so great as to render it almost unjustifiable. The distinction between the favorable and unfavorable classes of cases is then a matter of such vital importance that the conditions which determine the classification of the individual case demands a more extended discussion.

Exhaustion. It is impossible to determine the exact amount of physical exhaustion which must be present to render a patient unfit for the performance of a Cæsarean section, but for practical purposes it may be said that a patient whose pulse has permanently reached a rate of 90, or at most 100, or in whom tonicity of the uterus has developed, as shown by rigidity of the uterus between pains and by irregularity of the contractions, is no longer in a favorable condition for a Cæsarean section. Our experience has indeed shown us that patients in whom either of these conditions is present, although otherwise in good condition for operation, have a poor convalescence from the Cæsarean section and are on the border-line of danger.

Infection. The importance of the existence of infection of the uterus in determining whether Cæsarean section is the operation of choice or not lies in the fact that the opening of a septic cavity into the peritoneum is always to be avoided if possible. The uterus can, of course, be walled off from the peritoneal cavity with gauze, and the dangers of infecting the clean peritoneum materially lessened, but it is difficult to avoid contamination of the peritoneum from the large amount of liquor amnii which is usually present, and it is always a good surgical principle not to open an infected cavity into the peritoneum when we have an alternative.

Intercurrent Diseases. It may be laid down as a general principle that Cæsarean section is not well borne in eclampsia, or in any other diseases which tend to materially lower the power of resistance of the

whole system. Any special exceptions to this rule will be considered under the special headings to which they belong.

Choice of Operation. In favorable cases the mortality of all the cutting operations is so low that the preservation of the child renders any one of them preferable to a destructive operation on a living child, or to a difficult forceps operation which promises great danger to the child, and the question must be decided by their morbidity. The Cæsarean section has practically no morbidity, a fact which renders it the best of the major operations in the favorable class of cases. Symphysiotomy, on the other hand, is attended by a very considerable morbidity, and the convalescence from it is apt to be tedious and protracted. The dangers to be feared in a symphysiotomy are injuries to the sacro-iliac joints from over-stretching during the delivery, injuries to the bladder and urethra during the extraction of the child, non-union of the symphysis after operation with its accompanying disability, and, perhaps, infection of the wound on account of its situation in a place which is difficult to keep clean.

The only argument which can be advanced in favor of total extirpation in favorable cases is that it confers sterility on the mother, a point which will be taken up later.

In the class of cases which are unfavorable for the major operations, but in which they must be performed, the high mortality which obtains in the Cæsarean section and in the extirpation of the pregnant uterus rules them out, if any safer operation is possible. The mortality of symphysiotomy is not much increased even in very unfavorable cases, and the morbidity of the operation is here a matter of minor importance; therefore, symphysiotomy is the operation of choice for these cases if the size of the pelvis permits. If the pelvis is too small to allow the passage of a living child even after symphysiotomy, craniotomy becomes the operation of choice except in those cases where an extreme degree of pelvic deformity renders the indication for an abdominal delivery absolute.

Total extirpation has been recommended by some authorities to take the place of symphysiotomy in cases in which infection of the uterus is supposed to have already taken place. The real question which is thus brought up is, however, "Is hysterectomy justifiable treatment for puerperal infection?" The general consensus of the profession is against this method of treatment, and for this reason it seems best to omit any further consideration of the question here, to treat uterine sepsis after symphysiotomy in the ordinary way, and to reserve hysterectomy for those cases in which sterilization of the patient is deemed advisable.

Sterilization of the patient may be indicated in any case of Cæsarean section for definite reasons. If the presence of a tumor of the uterus renders sterilization advisable the method chosen should include the removal of the tumor—*i. e.*, an hysterectomy. If the operation is

decided upon merely because it is considered unwise to allow the patient to undergo the strain of future pregnancies which must terminate in abdominal deliveries, sterility may be conferred with less shock to the patient by the removal of the tubes and ovaries, by tying off the tubes, or by inverting the fimbriated ends of the tubes and closing them by means of a seroserous suture. Of these various methods the performance of an hysterectomy is usually preferred if the general condition of the patient is such as to permit the added shock of the additional operation.

The indications on which the choice of operation depends may be summarized briefly. Cæsarean section, if performed early in labor or at the time of election, is a simple operation with a good prognosis for both mother and child; but Cæsarean section, when performed after prolonged labor, or after violent efforts at extraction per vaginam, was a distinctly bad prognosis.

Symphysiotomy is attended by a slight but not serious mortality when performed early, but the morbidity which follows it reaches a high percentage. The principal dangers of the operation are injury to the bladder, urethra, and vagina during the extraction of the child, injury to the sacro-iliac joints from too wide a separation of the pubic bones, non-union of the symphysis, with consequent disability after labor, and infection of the prevesical space. The prognosis for symphysiotomy performed late in labor is little worse as regards the life of the mother than when it is performed early.

From this it follows that in the cases in which Cæsarean section is contraindicated in the interests of the mother on account of the prolonged labor or the condition of the uterus, symphysiotomy is the best operation, if the child is living, and if the pelvis is not contracted to too great a degree.

Extirpation of the uterus in late cases has a greater mortality than symphysiotomy. In favorable cases it has no advantages over the Cæsarean section except that it renders the woman sterile against future pregnancies.

In any case in which maternal death occurs after the child has reached a viable age, the immediate performance of a Cæsarean section is indicated in its interests, but in case any doubt exists as to the certainty of the diagnosis of maternal death, the child should be immediately delivered by version, since this operation will compromise the mother's chances less than abdominal section in case of her unexpected revival.

CHAPTER XVIII.

TECHNIQUE OF THE MAJOR OPERATIONS.

CÆSAREAN SECTION.

This operation dates back to very early times, historical tradition asserting that Julius Cæsar was delivered by this method, but among the ancients it was never performed until after the death of the mother. It is not until the fourteenth or fifteenth century that we find any record of its being performed on the living; and the maternal mortality was so great at that time that it led to the practical abandonment of the operation. The cause of death was usually either hemorrhage or sepsis. The uterine wound was not closed, because it was thought that the constant changes in the size of the organ after delivery would cause the stitches to cut out, but the uterine wound was left open to eventually close by adhesion to the abdominal wall if the patient survived the immediate dangers of the operation and the sepsis which almost invariably followed it. The use of the uterine suture was introduced in the early part of the nineteenth century, but it was not until Sänger, in 1882, introduced the complete closure of the uterine wound by multiple sutures and perfected the modern method that the operation became really practicable.

Time of Operation. In choosing the time at which the operation is to be performed the cases may be divided into two classes: those in which the necessity for an abdominal delivery is recognized before the advent of labor, and those in which it has been recognized for the first time after labor has begun. In our experience we have found that the most satisfactory plan is to operate on a predetermined date, as close to the estimated date of labor as possible, in all cases in which the necessity for Cæsarean section is evident during pregnancy. By this means an opportunity is given for a thorough preparation of the patient for the operation in the most approved manner. The theoretical objection to this mode of procedure that, labor not being present, the uterus will not contract properly after the operation, and thus produce hemorrhage, is not borne out by our experience, and there is no doubt of the fact that the patient has a more comfortable convalescence if she has had a thorough preliminary preparation for the operation. In the large number of cases in which it is necessary to wait for the test

of actual labor in order to determine the necessity for the abdominal delivery, and in those in which the diagnosis has not been made until after the beginning of labor, the operation should be performed at the earliest possible time after labor has begun. Cæsarean section should never be voluntarily performed on a patient who has been in labor over twenty-four hours, or on a patient who, although she may not have been in labor so long a time, does not fulfil all the requirements laid down in the last chapter.

Preparation for Operation. If the necessity for operation has been determined during pregnancy, and a date set for its performance, the preparation of the patient for operation should be begun two or three days before the appointed day. The bowels should be thoroughly emptied by free catharsis, supplemented by enemata, the preparation being started thirty-six hours or so before the time set for operation, and the diet being restricted during this period to the few articles of food which leave little residue—*i. e.*, clear soups, eggs, oysters, meat jellies, and nothing else. On the morning of operation the lower bowel should be thoroughly emptied by a large cleansing enema. This thorough emptying of the intestinal tract lessens the discomfort of the patient after operation to a great extent, as it reduces the tendency to tympanites, from which many patients suffer considerably, to a minimum. On the morning of operation no food should be allowed the patient, with the exception of a cup of coffee, tea, or beef tea, given not less than two hours before operation to prevent faintness. The urinary system should be thoroughly flushed out on the three or four days previous to operation by the administration to the patient of a large amount of water—*i. e.*, not less than fifteen or twenty glasses daily, the object being to secure by free diuresis the most complete elimination possible of the waste products in the system, as well as to lessen the amount of thirst after operation. If the patient is in any but the best condition the administration of tonic doses of strychnine is to be advised for several days before operation.

The preparation of the field of operation should be started about twenty-four hours before operation. The whole abdomen and the pubic region should be thoroughly shaved. This removes not only the hair, but also the superficial layer of the skin, and renders the subsequent sterilization more efficient. The skin should now be scrubbed with a strong solution of green soap, and a poultice of green soap applied and left on for eight hours or more. When the poultice is removed the soap remaining should be washed off with sterile water and the skin dried. The abdomen should now be scrubbed with ether to remove the fat from the skin, and this should be followed by a prolonged scrubbing with 1 to 1000 corrosive sublimate, after which a pad of cotton, soaked in the same solution, should be applied and left on until the patient is ready for operation.

Just before the operation is begun the final preparation of the abdomen should be performed. According to the most generally accepted practice at the present time this final preparation of the skin should include a thorough scrubbing of the skin with permanganate of potash, oxalic acid, and hydrogen dioxide, followed by corrosive sublimate and sterile water, although some operators are satisfied with the somewhat meagre protection against infection afforded by merely scrubbing the skin with corrosive, followed by sterile water.

The vaginal preparation should consist of a thorough douching, followed by a scrubbing through a Sims speculum, with sterile gauze, wet in 1 to 1000 corrosive. After this the vagina should be packed with iodoform gauze, wet in the same solution, which is to be removed just before operation.

The patient should be catheterized and the bladder completely emptied just before she is etherized.

In the cases where abdominal delivery is decided on after labor has begun, such careful preparation is impossible, but all the steps should be carried out as far as time permits. The bowels should be emptied as thoroughly as possible by enema. The skin preparation to be carried out is as follows: The field of operation should be shaved carefully and thoroughly scrubbed with green soap solution followed by ether. The skin is then scrubbed with saturated solutions of permanganate of potash, oxalic acid, and hydrogen dioxide, followed by 1 to 1000 corrosive sublimate and sterile water. The vagina should be thoroughly douched and scrubbed out with 1 to 1000 corrosive.

Preparation of the Operator and His Assistants. The hands of the operator and his assistants should be thoroughly sterilized by scrubbing them with soap and water for at least five minutes, followed by permanganate of potash, etc., as above. Sterilized gowns, caps, gauze masks, and rubber gloves should be worn during the operation by the operator and his assistants. Although Cæsarean section has been successfully performed with one untrained assistant and by the light of a tallow candle, the best of light and the presence of at least four trained assistants are much to be desired. For the best results the operator needs at least a competent etherizer and an experienced assistant to control uterine hemorrhage by compression of the cervix and broad ligaments. In addition the presence of a trained assistant to handle sutures and sponges, and another to assume charge of the resuscitation of the baby is desirable.

Instruments. The instruments required for Cæsarean section are a large scalpel, two dozen pairs of hæmostatic forceps, scissors, dissecting forceps, a needle-holder, and curved needles of various sizes. For sutures, silkworm-gut, medium-sized and fine silk, and catgut should be provided.

Sterilized gauze sponges and an aseptic dressing are necessary. Sterilized water or normal salt solution should be prepared for flushing out the peritoneal cavity, in case it becomes contaminated by blood or liquor amnii during the operation. Uterine hemorrhage may be controlled by an elastic tourniquet drawn tightly around the lower segment of the uterus and the broad ligaments, but it is much better to depend upon skilful manual compression applied by a competent assistant.

The ordinary stimulants used in surgical practice should be placed within reach of the etherizer, and also a hypodermic syringe, filled with aseptic ergot.

Hot and cold water for resuscitating the baby should be at hand.

Operation. When all the preparations are completed, the patient should be etherized, but not until then, since prolonged etherization of the mother has a distinctly harmful effect on the child. When thoroughly etherized the patient should be placed on the operating-table. The upper portion of her body and the lower extremities should be warmly wrapped in blankets, and the field of operation should be surrounded by sterile sheets or towels. The abdomen should be opened by a median incision of sufficient length to enable the operator to deliver the uterus through it—*i. e.*, one of from seven to nine inches. The circumference of the child's head is at least fourteen inches, and the whole uterus can be easily delivered through the incision necessary to extract the child. As soon as the uterus has been delivered, a large sterile towel or piece of gauze wrung out in hot water should be placed over the intestines behind the uterus, and other towels or pieces of gauze should be packed around the uterus in such a manner as to render impossible the contamination of the peritoneal cavity with blood or liquor amnii, when the uterus is opened. If the abdominal incision is not more than eight inches long it is not necessary to bring the abdominal wall together behind the uterus with a temporary suture as is sometimes advised.

The first assistant should now grasp the uterus and broad ligaments lightly in his hands, encircling the lower segment in such a manner that his hands compress the vessels of the broad ligaments against it, but firm pressure must be avoided, a slight compression will control hemorrhage, and anything more will paralyze the natural contractile power of the uterus.

As soon as the first assistant is ready, the uterus should be opened by a median incision extending from about its middle to within an inch or two of the fundus, and not less than seven inches long. The membranes should be ruptured without delay, and the child seized by the shoulder or feet, as is most convenient, and delivered at once. The placenta will very often be found lying beneath the line of incision, and should be pushed to one side or torn through

rapidly, as at this stage of the operation time is of great importance, since the fœtal circulation is cut off by the compression of the lower uterine segment, and delay jeopardizes the child's chances. The appearance of considerable hemorrhage at the time of opening the uterus, especially if the placenta is found beneath the line of incision, need occasion no alarm, if the lower uterine segment is being efficiently held, because the placental and uterine sinuses contain a considerable amount of blood, which is necessarily lost when the uterus is opened. When the child is extracted it should be held head downward while the cord is being clamped with hæmostatic forceps and cut. It should then be given to the assistant who has been detailed to look out for its resuscitation.

As soon as the child is disposed of the placenta should be manually extracted, care being taken that the membranes be removed as completely as possible. A hypodermic injection of ergot should now be given. As the operation is usually completed to this point in five minutes, an experienced operator who can depend on his speed may properly give the ergot at the beginning of the operation. The uterine cavity should be thoroughly emptied of clots, and the cervix, unless already dilated, may be dilated from above sufficiently to ensure free drainage of the lochia during the convalescence. The uterine wound should now be closed as expeditiously as possible, as the tying of the sutures usually ensures contraction and arrests hemorrhage. The uterus should be sutured with a double row of silk or catgut sutures. The first or deep row should be placed about a third of an inch apart, and should be inserted at from one-fourth to one-third of an inch from the edge of the incision and include the entire thickness of the uterine wall, with the exception of the decidua. If this is included its subsequent exfoliation will leave the sutures projecting into the uterine cavity, and this may provoke suppuration. This row should consist of interrupted sutures of medium-sized silk or catgut. The peritoneal covering of the uterus should now be brought together by coaptation stitches of fine silk or catgut, and the uterus replaced in the abdominal cavity. If by any chance severe hemorrhage persists after tying the sutures, the best procedure is an immediate hysterectomy. The abdominal packing should now be removed, and the peritoneal cavity, if it has been soiled by blood or liquor amnii, should be thoroughly flushed out with normal salt solution or sterile water. The abdominal wound should now be closed by a row of interrupted silkworm-gut sutures including all the layers. As the incision is always made through the distended raphe, and only a single layer of fascia is seen, layer-suture is not necessary. On account of this peculiarity of the incision, hernia is unlikely.

A sterile dressing and tight swathe and the usual obstetrical pad should now be applied, and the patient put to bed and surrounded

by heaters. If any symptoms of shock are present the ordinary treatment should be applied.

After-care. The after-care of the patient is that of any case after abdominal section, and requires no special description here. A special nurse should be provided, and for the first few days after the operation the patient should never be left alone. Several cases of death from internal hemorrhage have been reported, owing to the patient's sitting up or getting out of bed during the temporary absence of the nurse.

Lactation is seldom interfered with by the operation, though the appearance of the milk is liable to be somewhat delayed. The baby should be put to the breast at six-hour intervals as soon as the mother has recovered from the immediate effects of the operation, and nursing should be regularly begun as soon as the milk appears. Owing to the delay in the appearance of the milk, artificial feeding will probably have to be instituted for two or three days. The patient should be kept in bed for at least three weeks after the operation, and should wear a firm abdominal supporter for some months.

As Cæsarean section leaves the patient capable of repeated pregnancies it is desirable to know what the result of the operation on subsequent pregnancies will be. It has been stated that in most cases the uterus becomes more or less firmly adherent to the parietal peritoneum, with the result that considerable pain and inconvenience are suffered by the patient up to the sixth month of pregnancy, and that the adhesions interfere with the uterine retraction after the next delivery.

Judging from a somewhat limited experience in subsequent pregnancies this does not seem necessarily true. In three cases in which a second Cæsarean section was performed on the same patient, in one the adhesions between the uterus and the abdominal walls were found to be few in number, and very slight in extent, and, moreover, they had caused the patient little or no trouble during gestation. In the other two cases the previous incision in the uterus was found to be so perfectly healed that, though the line of incision was visible, no induration along the line of the scar could be felt, and no adhesions were present.

EXTIRPATION OF THE PREGNANT UTERUS.

Amputation of the uterus after Cæsarean section was first performed by Storer in 1868, but the patient died.

In 1876 Porro introduced his operation, which consisted of an amputation of the uterus, the stump being fixed in the abdominal incision and treated extraperitoneally. This operation produced a

distinct decrease (about one-half) in the mortality from the Cæsarean section, but had the disadvantage that if the patient survived the initial operation, she had to undergo the strain of a protracted period of suppuration until the cervical stump sloughed away.

When aseptic surgical methods came into general use Porro's operation was gradually superseded by the modern operation of supravaginal hysterectomy with intraperitoneal treatment of the stump, or total extirpation, according to the indications of the individual case. According to some authorities this operation is to be preferred to the simple Cæsarean section, but it appears best to reserve it for a definite indication arising from the conditions of the given case.

Prognosis. The prognosis of the operation when performed for hemorrhage or for malignant disease of the cervix, depends upon the condition of the patient at the time the operation is undertaken, and in the latter case on the extent of the malignant process.

There is no advantage to be gained in waiting for labor to begin, as hemorrhage is completely controlled by ligation of the uterine arteries, and the uterine contractions serve no purpose.

The preparation of the patient for operation is the same as that already described in the description of Cæsarean section.

An operating-table, supplied with an attachment for placing the patient in the Trendelenburg posture, is indispensable, as this is necessary in ligating the arteries in the bottom of the pelvis.

The instruments necessary are a large scalpel, two dozen pairs of hæmostatic forceps, a Cleveland suture carrier, or two long-handled, blunt-pointed, curved needles, scissors, dissecting forceps, needle-holder, and curved needles. Several pairs of large forceps for clamping the broad ligaments are also useful. For ligatures and sutures medium-sized and fine silk and catgut should be provided, and silkworm-gut for closing the abdominal incision.

The steps of the operation are precisely the same as those of the Cæsarean operation until after the removal of the child and placenta. At this point of the operation, instead of closing the uterine wound by suture, the operator proceeds to ligate the ovarian arteries and the broad ligaments, clamping the ligament on the side toward the uterus with suitable forceps, and cutting through it along the outer edge of the forceps. In the pregnant patient the blood-vessels are greatly enlarged, the arteries can be plainly felt, and the veins are evident. The ligation of the ovarian vessels is an easy matter, but great care is necessary in ligating the uterine arteries at their point of entrance to the uterus. It is a wise precaution to grasp the vessel with the thumb and finger, and pass the ligature from without inward, keeping the point of the needle as close as possible to the uterus, for it must be remembered that unless great care is used in passing the ligature the ureter may be ligated, with disastrous results.

When the ligatures have been passed and cut short the uterus is to be freed from the broad ligaments down to the cervical junction, and should then be amputated at this point. If bleeding points are still left in the stump, they should be seized with forceps and ligated with fine silk. If the stump continues to ooze freely, silk sutures, so placed as to control the hemorrhage, should be buried in the muscular and elastic tissue and covered with the peritoneal flaps.

The flaps of peritoneum which are left on the anterior and posterior surfaces of the stump must be brought together by a firm continuous suture of fine silk or catgut and the abdomen closed as in the preceding operations.

As the operation is an aseptic one, no drainage is required except in cases in which previous infection is suspected. Should the operation be performed upon a patient whose uterus has already been infected, it is advisable to place a drain down to the cervical stump, or in profound conditions of infection to perform complete extirpation, remove the whole cervix, and pack the lower portion of the pelvis with iodoform gauze which extends down into the vagina, by which route it is to be removed subsequently.

If the case was of the favorable class no serious complications are to be expected during the convalescence, which is to be conducted on the same lines as have been laid down for Cæsarean section. Lactation may be delayed, but should ultimately be successfully established. No lochial discharge is to be expected in these cases, as the uterus is removed and there are no torn surfaces in the birth canal. A discharge of blood-stained mucus may persist in these cases for a few days, due to oozing from the cervix, mingled with the discharge of the enlarged glands of the cervical mucous membrane. This is of short duration, however, and needs no treatment except the occasional application of the ordinary vulvar pad. Douching is unnecessary and might prove harmful in these cases.

SYMPHYSIOTOMY.

The first symphysiotomy of which any record has been preserved was performed in 1644 by a French physician, de la Courveé, on a dead woman in order to save the child. Other post-mortem operations were performed from time to time, but the operation was performed on the living subject for the first time in 1777 by Sigault, another French physician, with the result that both patients were saved. At this time Cæsarean section was almost uniformly fatal, and the new operation was hailed with great enthusiasm. For a time it was extremely popular, but owing to faulty surgical technique and to a lack of understanding of its limitations, its results were such that it fell into disrepute, and, except in Naples,

became practically obsolete about the middle of the last century (1850). Since that time, however, it has enjoyed transient waves

FIG. 122.

(PINARD.)

FIG. 123.

Sections of pelvic brim to illustrate symphysiotomy. (After PINARD.)

of popularity until at the present time it has assumed a recognized place in operative obstetrics as a life-saving operation in cases in

which Cæsarean section is contraindicated, and in which delivery of a living child per vias naturales is impossible.

By symphysiotomy is understood the opening of the pubic joint for the purpose of enlarging the pelvis. Experiments on the puerperal cadaver show that if the anterior wall of the pelvis is opened at the pubic joint, or through the pubic rami, a considerable increase in several of the diameters of the brim will result. As the two halves of the pelvis separate they rotate outward, the rotation occurring in the sacro-iliac joints; but if the separation of the pubic joint is carried beyond two and one-half inches, the ligaments of the sacro-iliac joints are stretched beyond their normal limits and partial rupture occurs with unfortunate after-effects on locomotion. The pelvic diameters are, however, unequally increased by the separation of the pubic bones. The exact amount of extra space gained in the different diameters has been accurately computed, but it is enough for all practical purposes to remember that the oblique diameters are increased to a considerably greater degree than the antero-posterior diameter, and when it is remembered that the oblique diameters of the pelvic brim are the diameters which are occupied by the long diameter of the presenting part in its passage through the superior strait, the advantages to be gained by this operation are obvious.

Symphysiotomy is distinctly a life-saving operation for the child, and, of course, is never to be performed when the child is dead, unless under very exceptional circumstances.

When a patient with a contracted pelvis is seen late in labor and the child is still alive, symphysiotomy is the operation of choice, provided that the pelvic measurements show a true conjugate of not less than 8 centimetres. If the true conjugate measures less than 8 centimetres, craniotomy, even on the living child, is usually the operation of choice. (See Contracted Pelvis.)

Preparation for Operation. The preparation of the patient for symphysiotomy requires that the rectum and bladder be thoroughly emptied. The pubic region and the surrounding parts must be shaved, and prepared for operation in the same manner as the abdomen for Cæsarean section.

Ether is the preferable anæsthetic. Any table of a convenient height may be used as an operating-table, and should be so placed that the patient can be brought down to the edge for the delivery of the child. The table should be carefully padded with folded blankets, covered by a rubber sheet.

Assistants and Instruments. For the proper performance of the operation three assistants are necessary—one to give the anæsthetic, one to act as first assistant during the operation, and another assistant or a nurse to be ready to do any service required by the operator, and afterward to resuscitate the child.

The instruments required are a large scalpel, a pair of uterine dressing forceps, dissecting forceps, six to eight pairs of hæmostatic forceps, a strongly-made, probe-pointed bistoury, or Galbiati's operating-knife, a metal catheter, and a pair of axis-traction forceps. A needle-holder, curved needles, and scissors are also necessary. For suturing the wound silkworm-gut is the best material. Hot and cold water should be at hand for use in resuscitating the child.

Technique. As soon as the preparations are made for operation, the patient should be etherized while the operator and assistants are scrubbing their hands for operation. As soon as she is ready, she should be placed on the table and the field of operation given a final cleansing, and the vagina thoroughly douched and scrubbed out with corrosive.

A gum-elastic catheter is now passed into the urethra. An incision is made just above the symphysis from one to two inches in length. The attachment of the recti muscles to the pubic bones is then separated to an extent just sufficient to permit the passage of the forefinger behind the symphysis. The forefinger of the left

FIG. 124.

Galbiati's sickle-shaped bistoury.

hand is then passed behind the symphysis and hooked under it. The sickle-shaped knife of Galbiati is then seized firmly in the right hand and passed along the index finger of the left hand until it in turn is hooked under the symphysis, which is now divided by an upward and forward rocking motion of the knife.

If the proper instruments are not at hand for the performance of the operation by the method just described it may be performed by making a direct incision over the pubic joint, which may then be divided from before backward with a heavy scalpel. The first incision has the advantage of being smaller, and of being much more easily kept clean, as it is further from the vaginal orifice, and, therefore, less liable to become soiled by the lochia, a consideration of decided practical importance.

In the latter case the finger must be kept behind the symphysis to protect the soft parts from injury.

The subpubic ligament must be thoroughly divided with due care to avoid injuring the erectile tissues below the arch, this being the only point in the operation which is liable to give rise to serious

hemorrhage. When the tissues are thoroughly divided a sudden separation of the symphysis will occur.

The wound should now be carefully covered by a temporary dressing and the patient brought to the edge of the table. The thighs should then be flexed upon the abdomen and carefully abducted until the resistance of the sacro-iliac joints is felt, or until sufficient separation of the symphysis has been accomplished to give space for the extraction of the fœtus. Separation of the pubic bones for more than two and one-half inches is unsafe. The occurrence of further separation during the extraction of the fœtus must be prevented either by the hands of two assistants, who exert pressure inward upon the opposite sides of the pelvis, or by a non-elastic belt so fastened around the pelvis as to permit no more separation than is considered safe. The catheter should now be removed from the urethra and the child extracted by either version or forceps. If there exists no special indication for version, such as a transverse presentation, delivery by forceps is ordinarily to be preferred, since it permits of a slower extraction and greater care of the soft parts than would be consistent with the child's safety in version, and also

FIG. 125.

Harris' symphysiotomy bistoury.

allows a more careful observation of the degree of separation of the symphysis.

After the delivery of the child and placenta, the bladder should be injected with a sterile solution colored by a harmless aniline dye, in order to detect any injury which may have occurred. If any tear in the bladder walls is discovered it should be repaired at once. The symphysis should then be brought together by pressure on the sides of the pelvis. All bleeding points should be secured by ligature or suture. The superficial wound should be closed with interrupted silkworm-gut sutures, but many operators prefer to insert a gauze drain in the upper angle of the wound, which should then be dressed aseptically. The pubic bones must be held in apposition by a tight belt around the pelvis below the iliac crest, or by tight strapping with adhesive plaster. A separate dressing is then applied to the vulva. Both dressings must be changed often enough to prevent contamination of the wound by the lochia. The insertion of a third dressing in the space between the other two dressings will materially assist in preventing contamination of the wound by the lochia. This dressing, as well as the vulvar dressing,

may be changed as often as necessary without disturbing the dressing which covers the wound, and the lochia will thus be prevented more surely from reaching the neighborhood of the wound.

The after-care of the patient is that of an ordinary obstetrical case, with the exception that she must be kept flat upon her back for at least three weeks and not allowed to sit up even in bed for four weeks, after which she can be allowed to get up gradually. The pelvic belt should be worn for a considerable period after convalescence is complete.

Operation in Cases of Maternal Death. Cæsarean section is the operation of choice in the interests of the child in case of the actual or impending death of the mother, when the child is alive and has reached the viable age—*e. g.*, when a woman who is the subject of a cancer of the cervix reaches a state in which she is manifestly unlikely to live many days and the child is alive and viable. When the mother is actually dead from accident or acute disease and the child is still alive, there is no question but that the physician is bound by every consideration to attempt to preserve the child's life by the most rapid method possible, which is, of course, a rapid abdominal section. Unfortunately, it is rarely possible in practice to establish absolutely a mother's death until an interval has elapsed which seriously compromises the safety of the child. For this reason the action of the physician must be regulated by his own confidence in his diagnosis of death, and by the attitude of the family in regard to the question. If the circumstances are such that both are persuaded of the certainty of maternal death, the operation should be performed at once, but the several steps of the operation should be carried out with the same exactitude as upon a living subject, so that in the event of the revival of the patient it would be possible to close the wound and give the woman a chance of recovery.

When any doubt exists as to whether the patient is actually dead or not, the child should be delivered by rapid manual dilatation of the os and version, since this operation, while less favorable to the chances of the child than abdominal section, still affords a chance of saving the child at reduced risk to the mother, in case an error of diagnosis has been made.

It is improbable that the child will live more than a few minutes after the death of the mother, but as a few cases have been reported in which a living child has been delivered more than two hours after the apparent death of the mother, the operation should be performed at any time within three hours of the maternal death, for although the child is in all probability dead, no harm can be done to the mother.

When in cases of advanced cancer, it becomes evident during the latter months of pregnancy that the mother is unlikely to survive

until term, and that the obstruction is so complete that Cæsarean section will certainly be required should labor set in, and from the woman's condition that a fatal result will follow the operation, it may be sometimes proper to perform the operation while the mother is still living, and before labor begins, for the sake of extracting a child whose vitality is unimpaired by the suffocation which necessarily follows cessation of the maternal circulation.

PART IV.

ABNORMAL LABOR.

CHAPTER XIX.

LABOR IN POSTERIOR POSITIONS OF THE OCCIPUT IN VERTEX LABOR.

PHYSIOLOGY AND MECHANISM.

LABOR in posterior positions of the occiput is usually longer than when the occiput is anterior, because, even if the head is well flexed throughout the labor, it is apt to enter the brim less readily, and the second stage is necessarily longer on account of the greater amount of rotation which must be accomplished before the occiput can appear at the arch. There is, moreover, in all cases a strongly marked tendency to extension, which is the prominent danger in this

FIG. 126.

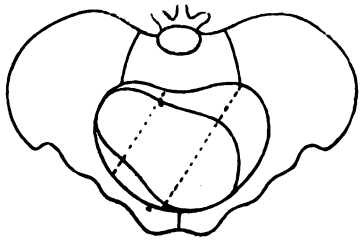
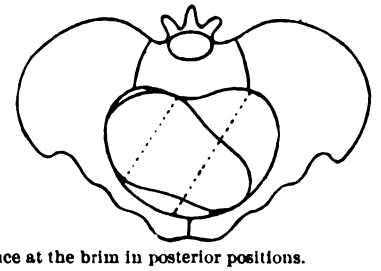


FIG. 127.



Diagrams illustrating the difficult entrance at the brim in posterior positions.

form of labor. When extension occurs it greatly prolongs the labor, and exposes both the mother and child to increased danger from the increased compression of the maternal soft parts and the fœtal head. If the extension is well marked, the delivery usually requires the intervention of the obstetrical art. In the few cases in which rotation of the occiput to the arch does not occur, and the head is delivered face to the pubes, the prognosis becomes still worse for both patients.

Passage of the Brim. The increased difficulty of the entrance of the posterior occiput into the pelvis is due to the fact that its

diameters bear much less favorable relations to the pelvic diameters than in anterior positions.

FIG. 128.

FIG. 129.

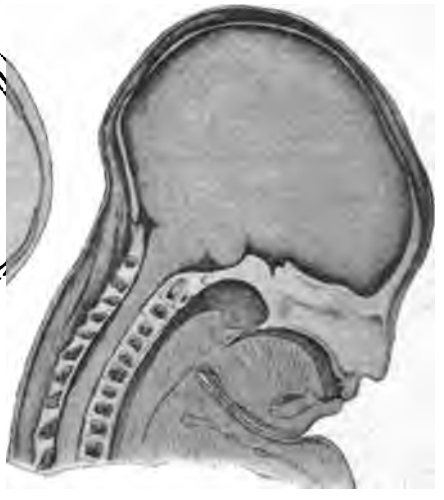
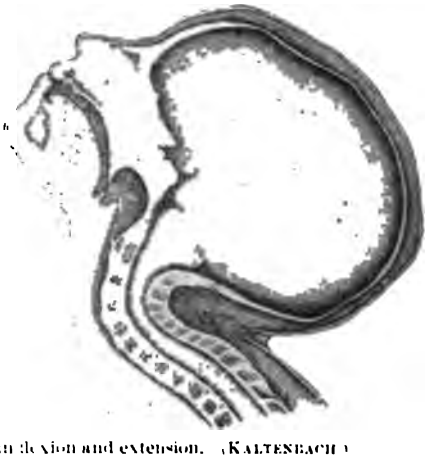


FIG. 130



Elevated spinal column of fœtus, in flexion and extension. (KALTENBACH.)

In anterior positions the large biparietal diameter of the head corresponds to an oblique line (the pubosciatic diameter), which is parallel and nearly equal in length to one of the oblique diameters

of the pelvis (Fig. 126), while the smaller sacrocotyloid diameter is occupied only by the small bitemporal diameter of the head. In posterior positions, on the other hand, the large biparietal diameter must pass through the narrow sacrocotyloid diameter of the pelvis, while the lesser bitemporal diameter corresponds to one of the oblique diameters of the pelvis. When extreme flexion is present from the time of engagement, the biparietal diameter of the head may occupy a somewhat more favorable pelvic diameter than the sacrocotyloid, and the head will pass through the brim without marked delay. In the majority of cases, however, the head comes to the brim in a but slightly flexed position, and under these circumstances the sinciput, meeting little or no resistance, tends to descend, while the occiput is arrested by the greater obstacle which is opposed to it. This at once produces extension, with the result that the long occipitofrontal diameter of the head becomes opposed to the oblique diameter of the pelvis. Descent of the forehead is now prevented by its pressure against the lateral walls of the pelvis, and no further progress can be made until flexion is re-established by the descent of the occiput. If the head is large, or if the pelvis is even slightly contracted, the delay not infrequently persists until exhaustion of the uterus sets in. If, however, the adaptation between the head and pelvis is easy, the impaction may be relieved by the passage of the occiput through the superior strait, when the remainder of the head will follow quickly.

Passage of the Excavation and Occurrence of Rotation. After the head has passed the superior strait, the occiput moves backward into the hollow of the sacrum. At this point the ample anteroposterior diameters of the excavation often permit a partial descent of the sinciput, while the occiput is arrested by infringement upon the forward curve of the lower part of the sacrum and coccyx.

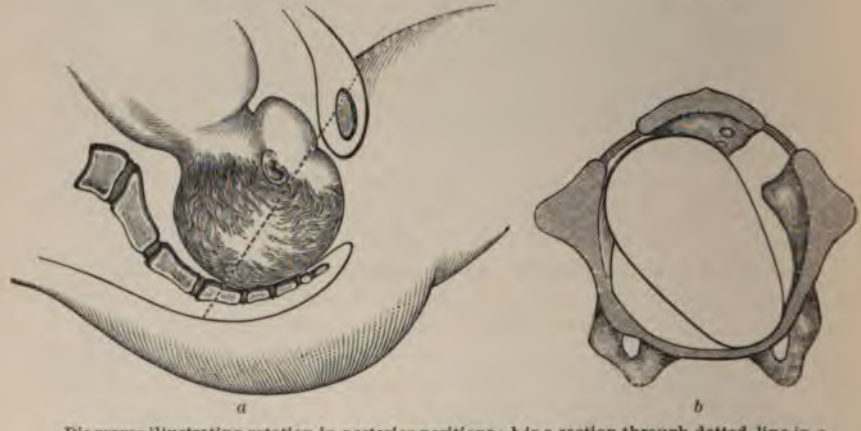
If this second movement of extension occurs, the head is again jammed across the pelvis by the opposition of the long occipitofrontal diameter to the oblique diameter of the inferior strait, while rotation is prevented by the fact that both ends of the cephalic lever are sufficiently low to feel the influence of the forward thrust which is due to the forward inclination of the lower portion of the posterior pelvic wall. As in the case when the head was blocked at the superior strait, progress is absolutely arrested until flexion is re-established. This may occasionally be brought about by the efforts of nature, but the arrest of a posterior position in the lower portion of the pelvis, usually necessitates the interference of the obstetrician.

Should good flexion persist or be re-established, rotation takes place under the same forces which are active in anterior positions, though it must be noted that the influence exerted upon the sincipital end of the head by the anterior wall, is much more marked here.

(Fig. 131.) When partial rotation has been effected the mechanism is, of course, that of anterior positions.

This brief exposition of the mechanism of posterior positions brings one fact into marked prominence. While descent and rotation normally occur as in anterior positions, the relations between the diameters of the pelvis and head are such that unless good flexion is present the entire mechanism of the labor fails, and unless art then interferes, the prognosis for both mother and child becomes in the majority of cases a serious one. Flexion, then, is the *sine qua non* of the normal delivery of posterior positions, and the obstetrician who bears this fact constantly in mind, and acts accordingly, will be far more successful than he who does not appreciate the importance of preventing extension in these cases.

FIG. 131. FIG. 132.



a *b*

Diagrams illustrating rotation in posterior positions; *b* is a section through dotted line in *a*.

The conditions which favor rotation are the existence of sufficiently strong pains, the presence of good flexion; an adaptation between the head and pelvis, which is neither excessive nor too slight; firm soft parts, and abundant vaginal secretions. The reverse of these conditions tends to prevent rotation.

Expulsion Face-to-Pubes. Before speaking of the management of these cases it seems well to mention an exceptional and abnormal mechanism. In exceptional cases it happens that the head reaches the pelvic floor with the occiput so far posterior that it slips backward over the edge of the sacrum and is reflected into the median line posteriorly by the pressure of the walls of the gutter which is formed by the extreme lower portion of the sacrum and the lateral portions of the fibromuscular pelvic diaphragm. Delivery by the efforts of nature or by the forceps is then difficult, and is only made

possible by the production of extreme flexion. If the contractions of the uterus are powerful, and the adaptation between the head and pelvis not too tight, the occiput as a whole is pushed forward by the shelving pelvic floor, while the sinciput is checked by the opposition of the anterior pelvic wall, with the result that an extreme degree of flexion is produced. The forward movement of the occiput continues until the occipital protuberance appears at the vulva. The perineum retracts from the nape of the neck, and the

FIG 133.

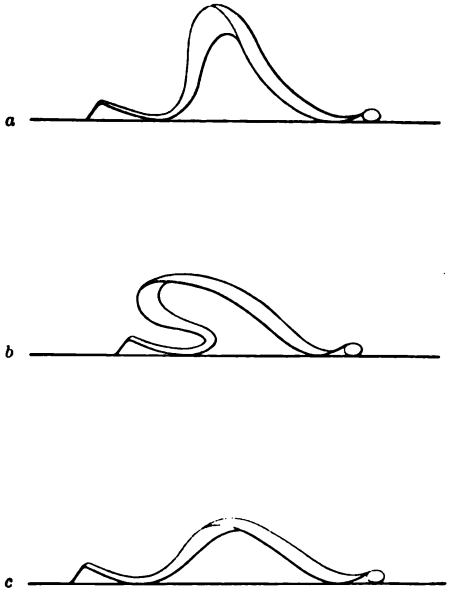
Diagrammatic view of mechanism in O. D. P. position, after posterior rotation of occiput. (LEISHMAN.)

occiput being freed from pressure while the sinciput is still exposed to the action of the intra-uterine forces, extension occurs and the face sweeps out under the symphysis. This process requires, however, such extreme compression of the frontal end of the child's head against the pubes that the child's life is often sacrificed during delivery. The perineum is, moreover, exposed to such extreme tension that extensive laceration is seldom avoided, and complete rupture is the rule.

MANAGEMENT OF THE POSTERIOR POSITIONS.

Management of the Passage of the Superior Strait. As can readily be seen from the brief description of the mechanism of the delivery of posterior positions given above, the prime essential to successful management of such a case is flexion, and every means within our power should be employed to secure and increase flexion from the beginning of labor until the head has passed the inferior strait. It is important that the membranes should be preserved intact, if possible, until the os is dilated or fully dilatable. The reason for this lies in the fact that if even a slight degree of extension occurs at the

FIG. 134.



Correct (*a*) and incorrect (*b* and *c*) knee-chest positions.

brim, it is enough, in many cases, to prevent engagement of the head until after the rupture of the membranes, and if this can be prevented until the condition of the os renders the forehead easily accessible, there is seldom any difficulty in flexing a head which is still free above the brim.

If the position is diagnosed, as it should be, by either abdominal or vaginal examination before engagement takes place, it is frequently possible to avoid the dangers of a posterior position by a preliminary rotation of the head. This can sometimes be accomplished by postural treatment. The patient should be placed in the knee-chest position, so that the head, under the influence of gravity, has a

tendency to leave the brim. The spinal column makes the dorsal half of the child the heavier and the force of gravity tends to promote the rotation of the child as a whole on its long axis into an anterior position.

If this treatment is properly carried out in appropriate cases, persistence will sometimes be rewarded by the desired result. It is essential that the position assumed should be the true knee-chest position. The buttocks should be directly above the knees, and the chest should be in actual contact with the bed. (Fig. 134 *a*.) This position, though less comfortable to the patient, is far more likely to accomplish the desired result than are either of the modifications which the patient tends to assume instinctively. (Fig. 134 *b* and *c*.) The patient should be encouraged to maintain this posture as long as her strength permits, or until examination without alteration of her attitude demonstrates the fact that rotation has occurred. She should be then placed in the latero-prone position on the opposite side from that toward which the occiput is directed—*i. e.*, right position of occiput, left side, etc., and this attitude should be maintained until the head is firmly engaged in its new position. Should the head, after once becoming anterior, show a tendency to revert to the posterior position, it may be wise to rupture the membranes in order to hasten the engagement of the head while still anterior.

If the postural treatment fails, or is not tried, the case should be left to nature until the membranes rupture. If good flexion is present, no treatment is necessary at this time, but the future progress of the case must be carefully watched by frequent vaginal examinations, so that the occurrence of extension may be combated from its first appearance. As soon as it becomes evident to the attendant that marked extension has occurred, the chances of passage of the superior strait, without the assistance of art, are so slight, that it is wise, after a single hour has passed without change in this condition, to etherize the patient, introduce the hand into the vagina, and dilate the os manually to a degree sufficient to permit flexion of the head by pressure of the palmar surface of the half hand against the forehead, the position of which in the anterior or shorter segment of the pelvis renders it the most easily accessible part of the head. When flexion has been secured the ether should be removed, and two fingers should be retained in position against the forehead, so that by pressure upon it its descent may be opposed during each succeeding contraction. The natural result—*i. e.*, arrest of the forehead combined with the unobstructed descent of the occiput, necessitates good flexion, and renders descent and rotation of the head possible. If the membranes persist until the os is fully dilated, flexion can usually be produced or maintained by simple pressure with the fingers upon the forehead during pains. This may be persisted in for one or two hours before any attempt is

made to reduce extension by introduction of the whole hand, unless signs of exhaustion appear on the part of either mother or child.

If, after flexion has been produced manually, extension occurs in spite of the efforts of the fingers to prevent it, or if, when good flexion is present from the start, the head is delayed at the brim until the usual indications for operation arise, it is better to abandon the expectant policy, and to resort at once to operative interference.

Operative Treatment of High Arrest of the Posterior Occiput.

When the indications for operation arise, the choice of the operation to be performed rests between three methods: the hand may be introduced, the occiput rotated to an anterior position, and the forceps applied. The forceps may be used with the occiput still posterior, or the child may be turned. This second method is

FIG. 135.

Manual correction of defective rotation. (FARABOEUF and VARNIER.)

allowable only when the first method is contraindicated or impossible for some reason, and the choice ordinarily rests between a manual rotation of the occiput to the front, with a subsequent application of forceps, and version with all its disadvantages. Manual rotation and the application of forceps possesses two disadvantages: that the head not infrequently returns to its original position during the manipulations incident to the application of the blades to the head when free above the brim, an operation which is by no means devoid of difficulty; or it may be attended by the displacement of one arm across the posterior surface of the neck, an accident which is likely to result in an extremely obstinate arrest of the head and arm at the superior strait, if extraction by forceps is subsequently given up and version resorted to. Although the use of forceps after manual dilatation and rotation is the better operation, operators

of small skill and experience may for these reasons sometimes be wise in a primary resort to version, unless this operation is distinctly contraindicated by the condition of the uterus.

Should manual rotation be decided on, the hand which has the same name as the position should be passed into the vagina until its whole palmar surface can be applied to the forehead of the child, while the other hand wrapped in a sterile towel makes efficient counter-pressure over the fundus. The forehead should be pressed upward until complete flexion has been secured, and the whole head lifted away from the brim. The internal hand should then be rotated within the vagina, without alteration of its grasp on the head, until the occiput is in the desired position, while the external hand, or those of an assistant, endeavors to secure rotation of the body by external manipulations. When the uterus is soft and the head free an experienced operator may be able to pass the fingers of the internal hand to the shoulder and thus secure rotation of the body to the opposite anterior position, after which recurrence of the posterior position is unlikely. After rotation has been effected, an assistant should seek to keep the head in position by external pressure until the forceps have been applied.

If version is absolutely contraindicated and manual rotation of the head fails, an attempt should be made to bring the head through the superior strait by application of the forceps to the unrotated head. This operation is distinctly less favorable to both mother and child than even version, and is only to be performed when rotation fails and version is contraindicated.

High Forceps in Persistent Posterior Positions. When version is contraindicated in these cases and it becomes necessary to apply forceps to the head while the occiput is still posterior, it is inadvisable to attempt to make the application to the sides of the head.

The position of the parietal bosses and their close application to the sides of the pelvis make it extremely difficult to apply the forceps accurately over them; while the greater space corresponding to the bitemporal diameter makes the application of the blades to this portion of the head much more easy, and, therefore, gives them a distinct tendency to slip forward into this region, even if properly applied at first. If the forceps come to grasp the bitemporal diameter, the first effect of traction of the handles is necessarily the production of extension, which either results in arrest of the head or involves the use of an increased and unnecessary amount of force in its extraction.

On the other hand, when the forceps are applied to the sides of the pelvis, they grasp the head obliquely, and their compressive force prevents rotation of the head from occurring, but since rotation cannot be expected to occur until after the head has passed the brim, this objection is not a serious one. As soon as the head has

been brought down through the brim, the blades should be removed and readjusted to the sides of the head for the low operation.

MANAGEMENT OF THE PASSAGE OF THE EXCAVATION.

When the head in posterior positions of the occiput has passed the superior strait, the ease and rapidity of its passage through the remainder of the pelvis is mainly dependent on the maintenance of good flexion and the occurrence of its usual consequence, prompt rotation to the arch. The treatment of this portion of the labor consists in the first place, therefore, of an effort to maintain good flexion or to restore it in case it has been lost; and in the second case, of the expedients which may be employed to favor or produce rotation of the head during its extraction, whenever from any cause a well-flexed head becomes arrested in a posterior position.

Maintenance of Flexion. Since extension is especially likely to occur after the head has entered the excavation, and because the delivery of even a well-flexed head is necessarily a somewhat longer process in posterior than in anterior positions, the efforts of the obstetrician to prevent the occurrence of extension should be redoubled after the head has passed the superior strait.

Frequent vaginal examinations should be made in order to learn whether any movement of extension accompanies the descent of the head. If this is found to be the case, the fingers of the examining hand should be held constantly against the frontal bones, as far away from the large fontanelle as the pelvic space permits from the time when the head first enters the excavation. In this way the descent of the sinciput should be prevented until the occurrence of rotation has carried it beyond the reach of the fingers. Careful observation of this precaution from the time the head first enters the excavation prevents a serious loss of flexion at this stage of labor, and usually renders unnecessary a recourse to the more heroic methods required for its re-establishment.

Re-establishment of Flexion. When extension occurs it must be reduced before further progress is possible. For the accomplishment of this purpose five methods are recognized: the forehead may sometimes be raised by simple pressure to it by the fingers; if the adaptation between head and pelvis is easy, the occiput may be drawn down by the half hand applied above or around it per vaginam; in case of the failure of these two methods separately they may be combined: the vectis may be used; or the forceps may be applied to the occipital end of the head with their pelvic curve reversed.

The manual restoration of flexion needs little discussion. The introduction of two fingers into the vagina to push up the forehead, or the introduction of the half hand to draw down the occiput are

simple manœuvres, and except for the fact that they may involve so much pain for the patient as to render the use of ether necessary, demand no special precautions. If these methods fail, as they may unless used early, the accoucheur is reduced to a choice between the use of the vectis, and the operation of reversed forceps, which is by far the preferable expedient.

The Vectis. The vectis (Fig. 136) was the precursor of the forceps. It was originally intended for extraction of the head by the application of leverage motions to one or the other side of the head, or to both in alternation. At the present day it is used solely for the reduction of extension, and even when used for this purpose labors under serious disadvantages. In the first place, its grasp of the head is dependent upon its possession of an exaggerated cephalic curve, which renders its introduction very difficult; and in the second place it subjects both the maternal and fœtal tissues to such serious risks of laceration, from the fact that its slipping can rarely be prevented without the application of an injurious amount of pressure. When it is used, the mother's tissues must always be

FIG. 136.

The vectis.

protected by the insertion of two fingers between the pelvic wall and the convexity of the cephalic curve.

Reversed Forceps. When the head is extended low in the pelvis, and has resisted the various methods of manual flexion, the operation of flexing the head by means of reversed forceps should be resorted to. This is, in effect, a mere extension of the old principle that the tips of the blades should always be directed toward the leading point. The grasp which the forceps takes upon the extended head, when they are applied with the pelvic curve reversed, is, however, so near the occipital end of the head that they are almost sure to slip after flexion has been produced. It should, therefore, be an invariable rule that as soon as the head is flexed, the forceps should be removed and reapplied.

Technique. As in ordinary operations the rectum and bladder should be emptied. The forceps should be placed outside the vulva, in the position in which they are to lie when applied to the head; that is with the transverse axis of the blades at right angles to the sagittal suture, and with the tips directed backward. If the lock is of the ordinary form, the blade should be selected which would be the left one, if the forceps were held in the usual position. The

handle of this blade should be grasped in the right hand, and under the guidance of two fingers of the left hand, the blade should be passed into the vagina, and adjusted as nearly as possible to the occipital end of the head. (Fig. 137.) The other blade should then be so applied as to correspond with its fellow, and the blades locked. Simple traction should now be made in the direction shown in the figure, all leverage motions being avoided. In this way the force of the instrument acts on the occipital end of the head only. The sinciput is delayed by friction against the pelvic walls, and flexion results from the drawing down of the occiput.

FIG. 137.

Reversed forceps.

This operation is both easy and safe, but the posterior position of the blades which is necessary for the production of flexion, renders them likely to slip if traction is persisted in after flexion has been secured. The traction should, therefore, be gentle and made with one hand, while the movement of the head should be watched by the fingers of the other hand, so that the forceps may be removed as soon as the small fontanelle is in the centre of the pelvis—*i. e.*, when flexion has been produced. The ether should then be removed, and the process of rotation left to nature, since lacerations of the vagina are far less often produced when rotation is effected by the uterine forces, than when it is procured by instrumental means. If, however, the condition of the patient necessitates immediate delivery, the forceps should be applied in the manner appro-

priate to the well-flexed head in posterior positions, and the child extracted with them.

Production of Rotation. When rotation fails to occur in spite of the presence of good flexion—*i. e.*, when a well-flexed head is delayed in a posterior position until the signs of exhaustion occur, this failure is usually due to a relative insufficiency of the *vis a tergo*, which must be compensated for by the substitution for it of the *vis a fronte* of the forceps.

FIG. 138.

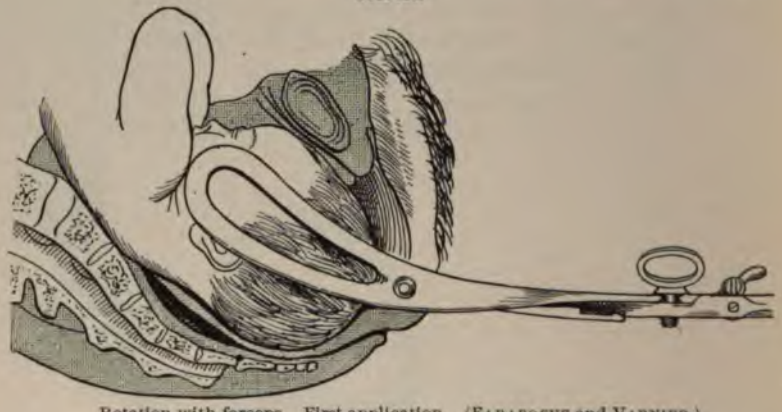
Forceps in defective rotation, the upper (right) blade introduced first.
(FARABOEUF and VARNIER.)

It is the first essential in the success of this operation that the instrument should be so applied that its presence in the vagina offers no obstruction to the rotation of the head.

Technique of the Application of Low Forceps to the Well-flexed Head in Posterior Positions. As long as the occiput is distinctly posterior to the transverse diameter of the pelvis, it is important that the forceps should be applied exactly to the sides of the head, and with their tips anterior—*i. e.*, directed away from the leading point. The tips should be anterior, on account of the impossibility of securing a firm grasp on the head with the reversed forceps. The blades should be accurately applied to the sides of the head, since in any

other position the compressive force would be directly opposed to the occurrence of rotation which is the immediate object of the operation. They should, of course, be applied as close to the occipital end of the head as is convenient, and during the applica-

FIG. 139.



Rotation with forceps. First application. (FARABOEUF and VARNIER.)

tion the handles should be well elevated, so that the tips may be well posterior when the application is concluded.

The first tractions should be made as far backward as the perineum will allow, and since the pelvic curve of the instrument makes it difficult to secure this line of traction in posterior positions

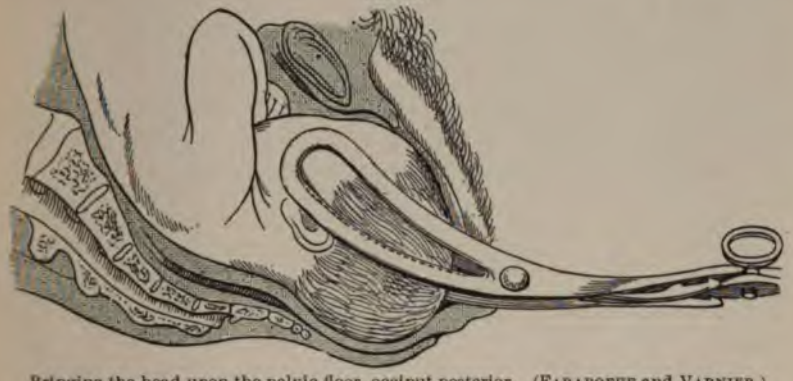
FIG. 140.

Forceps delivery in posterior rotation of the occiput. (FARABOEUF and VARNIER.)

by the ordinary methods, it is often well to employ the force of one hand upon the shanks of the instrument in the immediate neighborhood of the vulva, while the other hand steadies the extreme end of the handles. It is, perhaps, allowable to make use of gentle

movements of rotation in the desired direction when the head does not rotate under the influence of traction alone. During the extraction it must be remembered that, owing to the angle which the handles of the curved forceps make with the axis of the vagina,

FIG. 141.



Bringing the head upon the pelvic floor, occiput posterior. (FARABOEUF and VARNIER.)

rotation must necessarily be attended by a lateral motion of their part, and, although forcible rotation is unsafe, the operator must be careful to grasp the handles so lightly as to oppose no resistance to the occurrence of rotation, under the thrust of the pelvic planes.

FIG. 142.

Raising the occiput over the pelvic floor, the occiput posterior. (FARABOEUF and VARNIER.)

If a good pair of straight forceps can be secured, it is much the better instrument for low operations in posterior positions, since with them no such lateral motion occurs, and the removal of the necessity for watching for this greatly simplifies the operation.

When rotation has carried the occiput to a position in which the line of the sagittal suture coincides with the transverse diameter of the pelvis, the forceps should be removed and re-applied as closely as possible to the sides of the head, but with their tips directed toward the occiput. If the adaptation between the head and pelvis is anything but extremely easy, it is rarely possible to secure at this time anything better than an approximately correct application, but in this position the compressive force of the blades is a powerful agent in promoting rotation.

The tractions should be intermittent as in ordinary forceps operations. Rotation of the forceps and the head together should be favored, and the compression should be intermitted during the

FIG. 143.

Birth of head by forceps, occiput posterior. (FARABOEUF and VARNIER.)

intervals between the contractions in order to permit rotation of the head within the blades. When the occiput has become anterior the forceps should be removed and re-applied to the sides of the head, unless it has so rotated within them that the application is already satisfactory.

Low Forceps to the Persistent Occiput Posterior. In the rare cases in which the occiput is so exactly posterior as to miss the thrust of the sacrum, and settle into the gutter formed by the lateral portions of the pelvic walls and soft parts, it sometimes happens that all attempts to promote natural or manual rotation fail.

The production of rotation by instrumental means through an arc of 180 degrees is attended by so much danger of laceration of the

vagina that it is never wise. Should it be necessary to resort to artificial delivery in such a case, the forceps should be applied to the sides of the head with the tips anterior, and the extraction should be conducted in imitation of the normal mechanism of delivery of face-to-pubes cases. The method employed in these cases is usually spoken of as the pump-handle method of extraction. The first traction should be made downward and backward until the perineum is fully distended by the head. Without intermission of the traction its direction should be gradually swept upward until the small fontanelle appears at the fourchette, and the perineum retracts over the suboccipital region. The head is now in a position of exaggerated flexion. The line of force should now be swept downward toward the floor, again without intermission in the traction until the chin appears under the arch and the head is born by extension. In this operation the head is usually extracted through, rather than over the perineum, so that it is not a favorable operation for the mother, as it not uncommonly results in a complete rupture of the perineum with its disagreeable consequences. It also results in such extreme compression of the fœtal head against the anterior pelvic walls that the prognosis for the child is distinctly altered for the worse, and it should not be attempted unless the child is in fair condition, since the mother's interests demand craniotomy, unless there is at least a fair chance of delivering a living child.

CHAPTER XX.

ABNORMAL PRESENTATIONS.

BROW, FACE, BREECH, AND TRANSVERSE PRESENTATIONS. PROLAPSED EXTREMITIES.

UNDER the general heading of abnormal presentations are included all presentations except those of the vertex, namely, presentations of the brow, face, or breech, transverse presentations, and limbs prolapsed in front of the real presenting part.

BROW PRESENTATIONS.

The child is said to present by the brow when the bridge of the nose or the supraorbital ridges can be felt on one side of the pelvis, and the anterior fontanelle on the other, while the frontal suture occupies in the centre of the field the position held by the sagittal suture in vertex presentations.

Positions. The four positions which may occur in this presentation take their names from the location of the chin instead of from the occiput as in vertex presentations; for example, if the chin is directed forward and to the left, the position is brow left anterior, although it is produced by the extension of a right posterior position of the occiput.

Mechanism. This presentation usually offers an efficient obstacle to delivery during the life of the child, at any rate at full term. In long-neglected cases, however, if the uterine contractions are powerful, and the head is very small, its shape may be so altered by moulding as to permit its delivery without any change in the presentation. This cannot occur, however, until the shape of the head is so altered by the pressure of the pelvic walls that the prominence of the occiput is almost completely effaced, and the convexity of the forehead is increased to such a degree that it is capable of assuming the rôle played by the occiput in vertex cases as the leading point in the production of rotation. When such a change has occurred, the projecting brow receives the impulse of the pelvic floor and rotates to the arch.

After rotation has occurred the nose and upper jaw become flexed against the descending rami of the pubic bones, the occiput is pushed forward over the perineum into a position of excessive flexion, and

the head is born by extension. Such extreme moulding is rarely possible until after the death of the child, and is practically never seen at term, except in cases where the adaptation between the head and pelvis is abnormally easy, owing either to marked underdevelopment of the fœtal head or unusually ample pelvic diameters. In the rare cases in which spontaneous delivery of a brow does occur, the sinciput is almost invariably anterior from the start, and the natural delivery of a posterior brow is so rare that it can be practically left out of account.

Posterior positions of the brow are produced by partial extension of anterior positions of the occiput, and anterior positions of the brow arise from extension of posterior positions of the occiput. It would naturally seem, therefore, as if, in view of the greater frequency of anterior positions of the occiput, posterior brows would be more common than anterior brows, but this is not the case. The relatively unfavorable diameters of the pelvis through which the posterior occiput must pass render extension more probable than in anterior positions, with the result that anterior brows are rather the more common.

Prognosis. In neglected brow cases the prognosis for the child is almost necessarily fatal, but early interference improves the prognosis, which becomes that of the operation which is performed, without reference to the fact of the original unfavorable presentation.

The mother's life is endangered only by the exhaustion which follows long neglect. Her soft parts are always likely to be torn, not only on account of the dangers incident to any early operative interference, but because in prolonged cases the altered shape of the head subjects them to an increased strain during extraction by forceps or after version.

Management of Brow Presentations.

Unmoulded Brows. The discovery of a brow presentation at any stage of labor is sufficient indication for immediate operation. If the diagnosis is made early in labor and before any moulding of the head has taken place, the treatment called for is the restoration of flexion, after which the case may be left to nature, a careful watch being maintained for the recurrence of extension, or the child may be immediately extracted with forceps, according to the indications present in the individual case.

Slightly Moulded Brows. If the shape of the head is only slightly altered at the time when treatment is instituted, the choice of operation depends mainly upon the position of the brow. When the forehead is posterior, manual flexion results in the production of an anterior position of the occiput, and in this case the head may then usually, in the absence of pathological conditions—*i. e.*, contracted

pelvis, intra-uterine tumors, etc., be easily extracted by forceps. After the re-establishment of flexion, the head should be held in position by the hand during a few pains, but unless prompt engagement in a well-flexed position occurs, it is usually best to resort at once to forceps, since it may be fairly assumed that the causes which were primarily sufficient to produce extension are likely to reproduce it, if the case is left to nature.

In anterior positions of the brow flexion of the head results in the production of a posterior position of the occiput. In accordance with the general principles laid down for the treatment for posterior positions at the brim, it follows that anterior positions of the brow must be treated either by a primary version or be subjected to manual rotation in addition to flexion before forceps can be applied.

In cases in which even slight degrees of moulding of the head are apparent, the dangers and difficulties of the latter operation are so considerable that it is usually best to make version the operation of choice, although an expert operator is often justified in making an attempt at extraction with forceps.

Should version be contraindicated, resort must be had to manual rotation and the use of forceps.

In freeing a partially engaged brow from the brim of the pelvis as a preliminary to version, it is essential that the first pressure should be made against the forehead, since primary flexion and subsequent elevation expose the tissues of the mother to far less risk of injury than an attempt to force the extended occipitofrontal diameter of the head bodily upward, without first breaking up the impaction. Flexion is, moreover, an important factor in the success of the following manipulations, since its production minimizes the obstacle afforded by the projecting brow.

Neglected Brows. It may occasionally happen in consultation practice that a case is seen in which a brow presentation has been neglected until a marked alteration has taken place in the shape of the head. After such a prolonged labor as is necessary to produce such a marked degree of moulding, the child is usually either dead or in such poor condition that there is no chance of its surviving a severe operation, and craniotomy is indicated in the interests of the mother. In the rare cases in which the child is in apparently good condition the operation of choice is a version, if the condition of the uterus permits, since the shape of the fœtal head is so altered by the moulding it has undergone as to render the grasp of forceps insecure and their slipping almost a certainty.

FACE PRESENTATIONS.

Presentations of the face result from full extension of vertex presentations, and, therefore, occur in the same oblique diameter of the pelvis in nearly all cases as do presentations of the occiput.

Owing to the great rarity of primary O. L. P. and O. D. A. positions of the occiput, the occurrence of face presentations in the right oblique diameter of the pelvis is exceedingly rare, and for

FIG. 144.

Transverse position of face at superior strait. (RAMSBOTHAM.)

purposes of description the positions of the face may be considered as being two in number: mentum left anterior (M. L. A.), resulting from the extension of a right posterior position of the occiput, and mentum right posterior (M. D. P.), due to the extension of a left anterior position.

Mechanism. In face presentations the chin plays the same part in rotation as does the occiput in normal labor, and the existence of a complete extension is as necessary to the mechanism of face presen-

tations as is good flexion in vertex presentations. Complete rotation of the chin to the arch rarely takes place until practically the end of labor, so that even in anterior positions with a well-extended head and with the adaptation such that descent goes on readily, some obliquity usually persists until the chin is actually in sight of the vulva.

Rotation always occurs then, the face appears at the vulva, and sweeps forward to permit the occiput to be born by flexion.

FIG. 145.

Influence of extension in permitting descent. (KING.)

FIG. 146.

Forceps in face presentation. *P.* Parietal eminences. *m.* Malar protuberance. (FARABOEUF and VARNIER.)

The mechanism in face presentations is, then, descent and extension, rotation of the chin to the arch, and birth of the head by flexion.

In posterior positions extreme extension must be present, in order that the chin may receive the thrust of the pelvic floor, and rotate to the front. This can rarely happen except after extremely long labor and such excessive alteration of the shape of the head as results in a flattening of the cranial vault and an extreme elongation of the occiput. Delivery may take place spontaneously in exceptional

cases after this has occurred, but in the majority of cases the chin remains persistently posterior, and can be delivered only by operative interference.

Prognosis. The prognosis is usually worse for both mother and child than in normal labor, but differs greatly with the position of the chin.

In rapid face labor, with uncomplicated anterior positions of the chin, the prognosis is unaltered for the mother, and is but little worse for the child than in normal labor.

In posterior positions the prognosis for the mother involves a very considerable risk of exhaustion from delay under the most favorable circumstances, and the child is exposed to the utmost danger both from the inevitable compression of the cranium against the symphysis, and from the great tension on the tissues of the neck, which is a necessary concomitant of the extreme extension which must be present to permit rotation at the time when the chin impinges on the pelvic floor. (Fig. 146.)

In a large majority of cases, moreover, rotation fails, and the extraction of a living child is then extremely unlikely, even by the aid of forceps and after incision of the perineum.

The prognosis for the child in any but very rapid, anterior face labor is worse than that of immediate interference, the danger to the child lying in the interference with the cranial circulation which is produced by the compression of the vessels of the neck.

Management of Face Presentations.

It may be accepted as a rule in modern obstetrics that a face presentation exposes the life of the child and the soft parts of the mother to such risks that its discovery is an indication for immediate interference, with the single exception that if, when the presentation is first discovered, an anterior face is already deeply engaged in the pelvis and the progress is rapid, it may be left to the efforts of nature under careful supervision, in readiness to interfere at once, in case the progress is checked.

Chin-anterior High. An anterior position of the face which has not yet engaged in the pelvis is best treated by flexion into a vertex presentation if this is possible, as it almost invariably is at this time. As flexion of an anterior face produces a posterior position of the occiput, it should always be followed by the rotation of the occiput to an anterior position, after which the further progress of the case may be left to nature or the child may be at once extracted with forceps according to the indications present. If the attempts at flexion fail version should at once be performed and the child delivered.

Chin-anterior Low. When an anterior face is arrested low the application of forceps to the sides of the head is usually easy, and

has no particular risks to either mother or child, if care is taken in the application of the blades to see that their tips do not compress the neck, and if the temptation to extract the child with undue rapidity is resisted. Some laceration of the perineum is to be expected.

Chin-posterior High. An unengaged posterior position of the face should be treated at once by manual flexion, which will produce an anterior position of the occiput, the most favorable position possible; after which the case may be left to nature, a careful watch being maintained to prevent the recurrence of extension, or the child may at once be extracted with forceps, according to the general indications.

FIG. 147. FIG. 148.

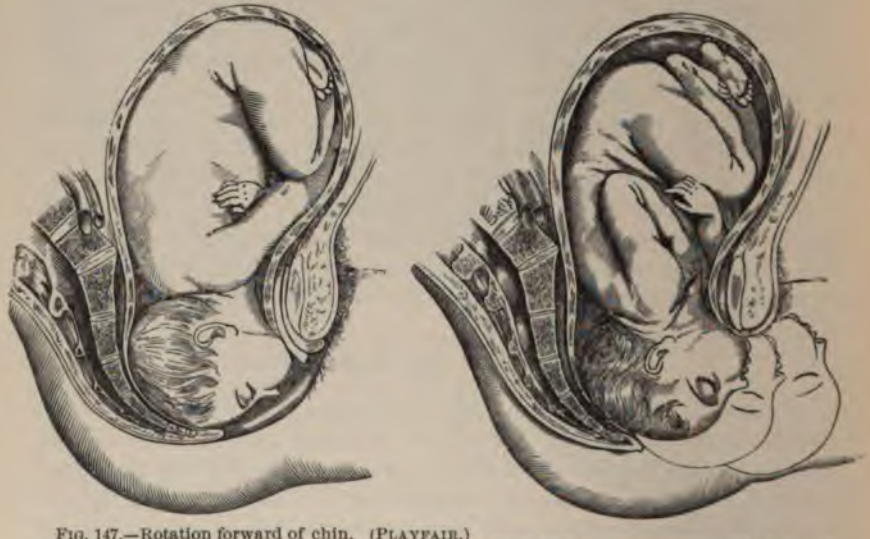


FIG. 147.—Rotation forward of chin. (PLAYFAIR.)
FIG. 148.—Passage of the head through the external parts in face presentation. (PLAYFAIR.)

If re-extension occurs flexion should be re-established, the forceps at once applied, and the child delivered. If flexion fails, version should be performed at once, unless it is contraindicated by the condition of the uterus, in which case, unless the child is in thoroughly good condition, a craniotomy should be performed. If the child is in really good condition, an attempt may be made to rotate the chin manually into an anterior position and deliver with forceps, but this operation is so difficult and so full of danger to both mother and child that a craniotomy is usually the better operation.

Chin-posterior Low. A posterior position of the face will rarely be seen deeply engaged in the pelvis except as the result of neglect on the part of the attendant. If the adaptation between the pelvis

and head is extremely easy, it may be possible to push the head back above the brim and flex it, or even to flex it within the pelvic cavity. These cases are, however, rare, and dependence must be placed in the main upon securing rotation of the chin to the arch either manually or with forceps, followed by immediate extraction.

FIG. 149.

Illustrating the position of the head when forward rotation of the chin does not take place. (PLAYFAIR.)

Should rotation fail resort must be had to craniotomy unless the child is in good condition. If, however, this is the case a symphysiotomy should be performed, after which rotation and extraction of the child with forceps will usually prove extremely easy.

BREECH PRESENTATIONS.

The fœtus may present by either extremity, by the breech, as well as the head, and, although breech presentations must be classed as abnormal, spontaneous delivery takes place in the large majority of cases, provided the normal mechanism is not interfered with.

No exact cause can be assigned for their occurrence, although incidentally the frequency with which they are associated with placenta prævia and low attachment of the placenta seems to indicate that they may be dependent on any condition which causes narrowing of the lower uterine segment. About 3 per cent. of all cases are breech or footling presentations. In determining the position of a breech the sacrum is chosen as the determinate point. Since the lateral diameter of the breech is greater than the antero-

posterior diameter, it usually occupies that diameter of the pelvis which is ordinarily occupied by the long diameter of the head—the

FIG. 150.

First, or left sacro-anterior position (S. L. A.) of the breech. (PLAYFAIR.)

FIG. 151

Lateral flexion of the body.

left oblique. The most common positions of the breech are, therefore, sacrum right anterior (S. D. A.) and sacrum left posterior (S. L. P.)

Mechanism. Under normal circumstances the child is driven through the pelvis under the influence of the uterine forces with the flexed lower limbs folded against the abdomen and the arms across the chest. As the soft breech is forced through the brim of the pelvis, it becomes much compressed or moulded, a process which is necessary before progress can take place. As the breech becomes moulded it descends lower and lower into the pelvis until it rests upon the shelving planes of the pelvic floor. The anterior hip now rotates to the arch, while the posterior settles into the hollow of the sacrum. As progress goes on and the breech advances in the pelvic canal, the body bends laterally upon itself (Fig. 151), the hips appear at the vulva, and the trunk follows. The head is usually kept in a position of flexion and the arms held down across the chest by the pressure of the intra-uterine force above. The arms emerge with the body and the head enters the pelvis in a state of flexion. The sinciput settles into the gutter of the pelvic floor, the face appears at the vulva, and the head is born in a state of flexion.

FIG. 152.

Passage of the shoulders and partial rotation of the thorax. (PLAYFAIR.)

Abnormal Mechanism of Breech Presentations. The abdomen of the child may exceptionally rotate to the front in natural breech deliveries, but this accident is more frequently observed after an improperly conducted operative extraction. In these cases the chin almost necessarily catches upon the symphysis pubis, extension occurs and the occiput impinges upon the posterior part of the pelvic brim. Delivery is then possible only by the production of complete extension. The body of the child must be swept forward over the mother's abdomen and strong traction applied to the feet in that position with one hand, while the other hand is introduced into the vagina and made to free the posterior part of the head by forward pressure upon the back of the neck. After the relief of the impaction the head readily passes the pelvis, the occiput appears at the

vulva, and is followed by the forehead and face. In the rare cases in which the head enters the pelvis well flexed, and with the face anterior, the reverse of this procedure must be adopted, and the body must be dropped toward the floor while traction is made on the feet; the face now appears at the vulva, and the head is born by flexion.

Prognosis. In breech presentations the prognosis for the mother is worse than in normal labor only in so far as the frequent necessity for a rapid extraction of the child exposes her to additional risks of cervical and perineal lacerations. The prognosis for the child is distinctly less favorable than in normal labor, since a considerable proportion of breech children are lost under the best care. The exact fœtal mortality varies within such wide limits with the skill of the attendant that an attempt to state it accurately is useless.

Breech cases are divided into presentations of the whole breech and of one or both feet. The prognosis for the mother in footling presentations is precisely the same as when the whole breech presents, but is somewhat worse for the child, on account of the increased liability to compression of the cord. For the same reason presentations of both feet have a correspondingly worse prognosis than those of one.

Management of Breech Presentations. Normal Breech Labor.

In natural breech labor the first duty of the attendant is to avoid unnecessary interference with the normal mechanism of the case by making ill-advised tractions on the presenting part. It should be perfectly understood that interference with a breech case which is making satisfactory progress, and in which no indication for immediate delivery has arisen, is responsible for a large proportion of the fœtal mortality which is ordinarily laid to the charge of the breech presentation. In normal breech labor the accoucheur should limit his sphere to relieving the perineum from undue strain by elevation of the hips as soon as they appear at the vulva; to reducing the bulk of the presenting part by extracting the legs as soon as the feet appear; to drawing down and freeing a loop of the cord as soon as the umbilicus comes within reach, in order to remove the danger of undue tension on the cord during the remainder of the delivery; and to sweeping the body forward over the mother's abdomen in the curve of Carus as soon as it is delivered, so that the rotation and expulsion of the head may not be interfered with by its weight. The result of unnecessary tractions upon the breech is usually the extension of the arms and head, since the friction of the head and arms against the pelvic floor produced by the tractions is apt to be more effectual in causing extension than the power of the uterine contractions in maintaining flexion, and the arms become extended and enter the pelvis at the sides of the extended head.

Further progress is now impossible until an operative release of the extended arms is effected, and the child is thus subjected to a risk of delay which materially lessens its chances of survival.

One other and extremely important duty remains to be spoken of. From the time the breech first engages in the pelvis until the cord is within reach of the finger, the obstetrician should maintain a constant watch upon the fœtal heart, in order to detect the earliest indication of any alteration of the circulation of the child from compression of the cord against the pelvic walls. If any persistent alteration of the rhythm of the fœtal heart is noted, the conservative policy hitherto adopted should be instantly abandoned, and rapid delivery resorted to at once, since, if the cord has been once subjected to pressure, its circulation is almost certain to be arrested entirely during the further progress of the case, and if interference is likely to be necessary at all, it is far better that it should be undertaken while the child's vitality is still unimpaired.

Rapid Extraction of the Breech. High Arrest.

When the breech is arrested at the superior strait, until the signs of exhaustion of one or the other patient appears, or when rapid delivery becomes necessary on account of some pathological condition which threatens the life of either patient, five methods of securing the descent of the breech into and through the pelvis are applicable.

Traction may be made upon the groin with the finger, the fillet, or the blunt hook; forceps may be applied to the breech, or the hand may be inserted into the uterus and a leg brought down for use as a handle with which to make traction.

Extraction by the Finger. If the finger reaches the groin with sufficient ease to make efficient traction on the breech, this procedure is always preferable to all others. In operations for high arrest of the breech, however, the use of the finger is unfortunately seldom possible, except in cases where some pressing emergency necessitates the immediate delivery of a distinctly small breech.

The Blunt Hook. Both the fillet and the blunt hook can usually be applied to the groin in any portion of the pelvis without especial difficulty, and both furnish fairly efficient means of traction. Both, however, labor under the disadvantage of exposing the tissues of the child to great risks of injury, the blunt hook being, in skilful hands, perhaps the less dangerous. The blunt hook should be passed up between the anterior hip of the child and the horizontal ramus of the pubes under the guidance of the finger until it can be so rotated that its point passes between the child's thigh and abdomen. The finger should then be passed between the thighs and brought into contact with the point of the hook, which should

then be settled downward by gentle traction until it fits snugly against the hip-joint. The fingers must be kept in contact with the tip of the hook throughout the extraction, in order to guard the soft parts from injury as far as possible. The line of traction should be directed slightly toward that side of the mother on which the sacrum of the child lies (Fig. 154), since in this way the force of the traction is exerted upon the child's pelvis, whereas, traction in any other direction results in the application of force to the shaft of the femur, with the probable result that, both ends of the femur being fixed, a fracture will be produced. This accident is especially frequent in posterior positions of the sacrum.

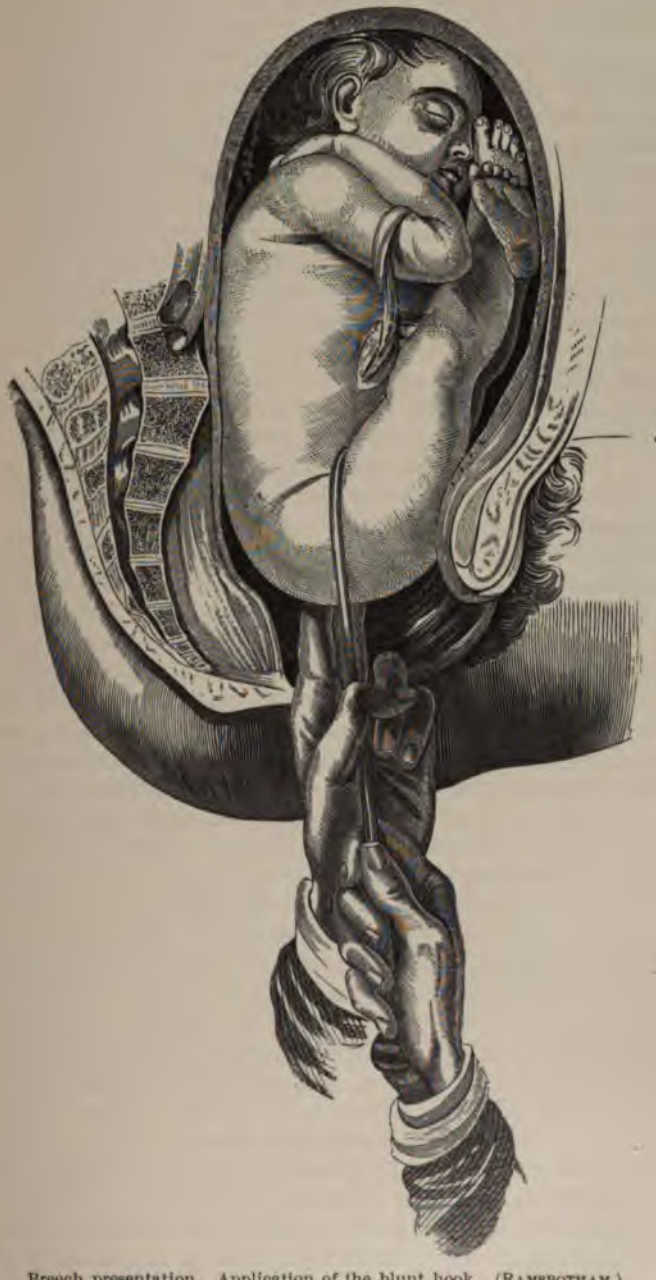
FIG. 153.

Budin and Lefour's method of traction. (PARVIN.)

The Fillet. The fillet may be made of a piece of broad tape (preferably linen, on account of its greater strength), or of a wide strip torn from a silk handkerchief. The best fillet for this purpose is, however, that made by passing a stout cord through a piece of rubber tubing about three-eighths of an inch in diameter. The fillet may occasionally be passed through the groin by the unaided fingers, but in all except the most simple cases, its adjustment in this manner is impossible.

Several ingenious porte-fillets have been devised, but their place is equally well filled by a very simple device which can readily be

FIG. 154.



Breech presentation. Application of the blunt hook. (RAMSBOTHAM.)

improvised at the time of operation. A large, English-webbing catheter is threaded with a double loop of strong, narrow bobbin, and its stylet is bent to the shape of a blunt hook. The catheter is passed into the groin, the finger draws down the loop of string until the end of the fillet can be knotted within it, and by traction on the string it is drawn close to the tip of the catheter. The instrument is then removed by a reversal of the process by which it was introduced, and the fillet settles into position in the groin. The use of the fillet is as liable to result in fracture of the femur as is that of the blunt hook, and the same precaution must be observed as to the direction of traction, and it is rather more liable to result in sloughing of the tissues of the groin, a fact which renders it the worst of the methods which may be used for extracting a breech.

Forceps to the Breech. Until a comparatively recent date it was commonly stated that the presentation of any part of the fœtus except the head was an absolute contraindication to the use of forceps. It is now known, however, that if forceps are accurately applied to the breech, injury to the child rarely results, and that the forceps furnish us with perhaps the most effective means at our disposal for the rapid extraction of a breech. If the position of a breech is oblique, the tip of one blade should lie against the upper sacral vertebræ, while that of its fellow should be pressed into the surface of the most easily accessible thigh.

If the position of the hips is transverse, each tip should impinge upon a hip just above the great trochanter, and in this way a firm hold is obtained for the blades. If the application is carefully made in either of the above positions, no dangerous compression can be applied to the child, and the comparatively small size of the breech as compared with the head makes a correct application easy.

Application of Forceps. The forceps should be placed in an approximately correct position upon the breech. One hand should then be passed into the vagina until the finger-tips can touch the exact spots at which the tips of the blades should lie. An accurate adjustment can then be easily obtained by direct movements of the tips of the blades with the internal fingers. The small size of the tapering breech, in comparison with the diameter of any pelvis through which a livinge hild can be extracted, renders this manœuvre easy. When the forceps are once in position the handles should be brought together sufficiently tightly to ensure a firm compression, which should then be maintained without relaxation until the delivery is accomplished. The ordinary forceps are better adapted to this application than any of the special forms which have been devised, and the advantages of axis-traction are perhaps more fully apparent in high arrest of the breech than in any other obstetrical operation.

Extraction of a Leg. The introduction of a hand to bring down a leg requires no special description other than that all the precautions proper to the performance of version should be observed, and that the operator should be careful to observe the position of the cord, and thus avoid the production of an unnecessary prolapse. The leg when extracted should be wrapped in a warm aseptic towel and traction made upon it in a line which should at first be directed as far backward as the perineum allows, in order that the force may be applied as nearly as possible in the axis of the superior strait. As the breech descends the line of traction should swing forward until, at the time the hips clear the vulva, it becomes nearly vertical.

As soon as the knee is well outside of the vulva, the grasp of the hand should be shifted to the thigh, as traction upon the lower leg is apt to result in injury to the ligaments of the knee joint. As each successive part of the child emerges from the vulva it should be wrapped in warm towels, the object being to prevent premature efforts of respiration on the part of the child, which might be induced by the stimulation of the cold air.

If there is any difficulty in bringing the breech to the vulva, its delivery may be assisted by hooking a forefinger into the other groin as soon as it is within reach, and as the breech descends the perineum it should be drawn well forward and every effort made to prevent a laceration, precisely as is done in the delivery of the fore-coming head. When the second knee appears at the vulva it should be drawn along the side and toward the back of the child until the foot can be released by flexion of the leg upon the thigh. During this process traction upon the shaft of the femur must be avoided, as it is always likely to cause fracture. Care should also be taken to bend the knee only in the natural direction.

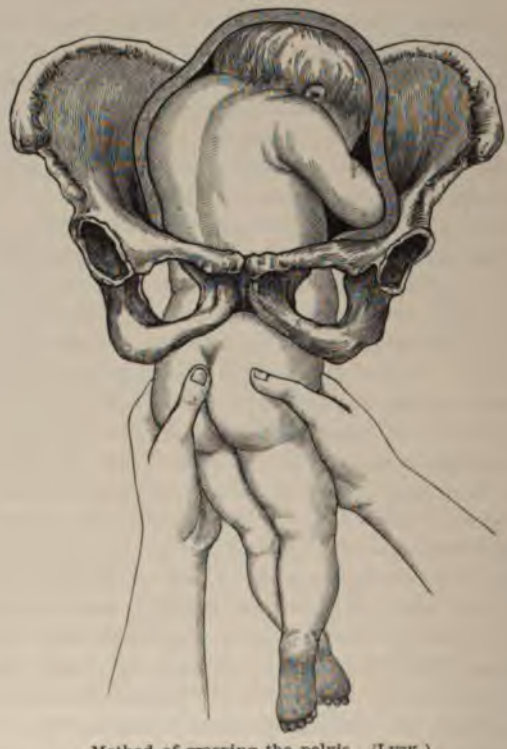
Choice of Methods. In high arrest the use of the finger is seldom possible. The fillet and blunt hook are so likely to injure the child's groin that when the breech is high and movable, and the uterus is in a relaxed condition, the choice should ordinarily rest between forceps and the extraction of a leg. At this time the bringing down of a leg is the easier operation, and generally the more efficient, since, in addition to furnishing a convenient handle, it greatly diminishes the size of the breech. If, however, the breech is firmly engaged, and the uterus is so far retracted as to resist the introduction of the hand, the use of forceps should be preferred.

The only objection to the employment of forceps is the argument that it is likely to result in laceration or sloughing of the soft parts of the child—a statement which has been amply refuted by the fact that in actual practice such results are not seen. It rarely fails to deliver the breech in any case in which delivery is possible, unless both legs are fully extended across the abdomen and chest of the

child. In this case, as was originally pointed out by Barnes, the lower extremities act as a splint to the body, and prevent it from following the serpentine curve which is necessary for the delivery of the hips. In this condition the extraction of a foot is the only method which is likely to be successful.

In low arrest extraction of the breech by means of the finger is the best operation, and is usually successful; but if it fails, forceps should be applied. The use of the blunt hook is less dangerous than in the high operation, but is inferior to forceps.

FIG. 155.



Method of grasping the pelvis. (LUSK.)

Extraction of the Body. When the hips have cleared the vulva and the popliteal spaces appear, the legs should be extracted by hooking a finger into the hollow of each knee, one after the other, and drawing them along the child's sides toward its back, thus flexing the knee and bringing the foot to the vulva. When both legs have been released, one thigh should be grasped by the fingers of each hand, while the thumbs lie along the sacrum (Fig. 155), the line of traction should be directed as far backward as the perineum allows, and in

posterior positions the back of the child should be rotated forward during each of the remaining tractions until the position of the sacrum is obliquely anterior. It must be remembered that, since the shoulders must pass the brim in an oblique diameter, full rotation to the arch should not be completed until after this has occurred.

Careful pressure over the fundus of the uterus during extraction by the hands of a trained assistant may do something to maintain the flexion of the head and arms, and thus greatly facilitate their delivery later.

A towel wrung out in a warm corrosive solution should be kept wrapped around the breech, both to prevent the hands of the operator from slipping and to lessen the liability to premature respiration which contact with the air may induce.

As soon as the umbilicus appears at the vulva, a finger should be passed into the vagina and enough of the cord drawn gently downward to prevent any further dragging upon the navel. If the cord is found to be pulsating strongly at this time, there is no need for hurry during the extraction of the arms and head, but if the pulsations are found to be feeble and irregular no time should be lost in completing the delivery. If the arms have remained folded upon the chest it is an easy matter to hook a finger successively into each elbow and extract them; but if, as is usual, they have become extended above the head by friction against the walls of the canal, their release is a more difficult matter. In this case the body of the child should be delivered until the angles of the scapulæ appear at the vulva. The extended arms are now within comparatively easy reach, and the head has not as yet entered the pelvis. The body of the child should now be dropped toward the floor, and drawn as far backward as the perineum allows. Two fingers are then passed over the anterior shoulder and along the upper surface of the arm to the bend of the elbow. The arm is pushed downward and backward across the face of the child by pressure in the bend of the elbow, great care being taken to avoid direct pressure on the humerus, and as the elbow appears at the vulva the fingers slide along the forearm to the hand and sweep it outside the vulva.

The child is then raised toward the mother's abdomen and slightly to one side by strong traction on the feet, and the operator releases the perineal arm by the same procedure.

The child is then laid astride of one forearm, and the hand which belongs to it is passed into the vagina until its first and second fingers lie upon the canine fossæ of the child. The other hand is hooked over the shoulders with the neck between its first and second fingers, and their tips upon the supraclavicular regions. The assistant then presses the head downward by suprapubic pressure applied in the axis of the superior strait, and both hands of the operator make simultaneous traction as nearly as possible in the

same direction. The operator endeavors at the same time to preserve the necessary flexion of the head by traction upon the canine fossæ with the internal hand. (Fig. 156.) As the head emerges the line of traction sweeps upward in the curve of Carus until at the end of the extraction the body of the child rests on the other forearm along the mother's abdomen.

When the mouth appears at the vulva, all necessity for hurry ceases, and the operator's efforts should be directed to the preservation of the perineum. All traction should cease, the upper hand should promote flexion by restraining the descent of the occiput, and the other hand should be used to shell out the head by pressure upon the forehead through the perineum, or, if necessary, by passing two fingers into the rectum.

FIG. 156.

Artificial delivery of the head in pelvic presentation. (LEISHMAN.)

This is known as the method of extraction by combined traction on the face and shoulders. It may sometimes be replaced with advantage by the method known as Deventer's (because introduced by an obstetrician of that name about the year 1715). This method was warmly advocated by Deventer, but fell into disuse and was practically forgotten until, within a comparatively recent time, it has been revived and highly praised by several prominent American obstetricians. It is so simple and rapid a procedure that it is worthy of trial in any case in which the shoulders can be brought readily into view. By this method the after-coming head and the extended arms are extracted together by simple traction on the feet

and shoulders. When the shoulders appear at the vulva the body of the child is swung sharply toward the floor. The feet are grasped by one hand and the shoulders by the other, and both hands make traction simultaneously directly toward the floor. (Fig. 157.) By this manœuvre the arms, which lie by the side of the head, are pressed against the yielding and elastic sacrosciatic ligaments, the chin is arrested by the pelvic floor, extension occurs, the occiput appears at the vulva, the head is born by extension, and the arms follow. The advocates of this method believe that the perineum is

FIG. 157.

Deventer's method.

never torn when this method is employed, and this somewhat astonishing claim is borne out by a limited number of cases in which the authors have tried this method of extraction. The ease and rapidity with which delivery can sometimes be accomplished by this manœuvre is very surprising. It is, however, only applicable to cases in which the head and arms have already entered the pelvis, as it is not successful in cases of high arrest. This limits its usefulness to some extent, because, if, in attempting it, arrest occurs at the brim, the difficulty of extracting the extended arms is increased by the fact that the head and arms are wedged

into the brim together, and the chances of sufficient delay to seriously compromise the child's safety are decidedly increased.

After the delivery of the child the uterus should be watched by an assistant, and every precaution taken against post-partum hemorrhage, which is not unlikely to follow the rapid emptying of the uterus under the profound surgical anæsthesia which is proper and necessary in the performance of version or in the operative delivery of a breech.

Unless the child has reached the stage of pale asphyxia and feeble heart, it is well to hold it suspended by the feet for some time after delivery before cutting the cord. This promotes the return of blood to the brain, permits the normal influx of blood from the placenta, tends to drain away the inspired liquor amnii and mucus, and is in itself a valuable method of resuscitation. In case it is thought necessary to proceed at once to more active treatment, time can often be saved by breaking the funis near the vulva at such a distance from the child that its end can be readily compressed by the hand that holds the child. A broken cord rarely bleeds, and it can be tied at the proper distance from the umbilicus after all hurry has ceased.

Difficult Extraction of the After-coming Head and Arms.

The difficulties met with in extraction of the after-coming head and arms are due to one of the following conditions: (*a*) Arrest of the head and arms together at the superior strait, owing to the fact that the pelvic diameters are not sufficiently ample to permit the extraction of the head and arms together; (*b*) arrest of an arm so caught behind the occiput as to render descent of the head impossible; (*c*) closure of a constriction ring or recontraction of an imperfectly dilated os around the child's neck; or (*d*) to arrest of the head, after the arms have been extracted, by its excessive size, by the occurrence of extension, by a rigid perineum, or by contraction of the pelvis.

Arrest of the Head and Arms at the Superior Strait. When the child is large, or when the transverse diameters of the pelvis are diminished, the wedge formed by the head and arms is often too large to pass the superior strait. In such a case the arms must be extracted before the head can enter the pelvis, and it is of distinct advantage in facilitating the extraction of the arms that no strong tractions should have been made in the attempt to bring the head and arms together through the superior strait. Such tractions, in a case where relative disproportion exists between the pelvis and the entering wedge, can only result in producing an impaction of the head and arms at the superior strait, with the result that the subsequent extraction of the arms is rendered much more difficult. For

this reason it is a safe rule that the arms should be extracted in all cases when the angles of the scapulæ appear at the vulva, as at this time the head is still free above the brim and the extraction of the arms is attended with little difficulty. On the other hand, if tractions are made in the effort to bring the head through the brim, the head and arms may in any case become so firmly wedged in the superior strait that the delay incident to breaking up this impaction and bringing down the arms may result disastrously for the child.

The extraction of the arms from the superior strait is a much more difficult matter than their release after they have entered the pelvis, and is effected by a different manœuvre. The arrest appears at about the time when the angles of the scapulæ appear at the vulva, and before the child's back is wholly rotated to the front. Should such an arrest occur in cases where the effort has been made to bring the head and arms through the brim together, and very moderate tractions fail to overcome it, all traction should be stopped. The thorax of the child should be grasped by both hands, pushed slightly upward to relieve the impaction, and rotated, unless the child already occupies this position, until the antero-posterior diameter of the child corresponds nearly if not exactly to the transverse diameter of the pelvis. The feet should then be seized by the hand of the operator which corresponds to the child's back, and drawn firmly upward and to that side, toward the groin of the mother. This serves the double purpose of drawing the posterior arm more deeply into the pelvis, and of making room for the passage of the operating hand into the vagina.

The free hand is then passed rapidly along the abdomen of the child to the posterior shoulder, and one or two fingers are passed along the arm and hooked into the bend of the elbow, which is then drawn downward and across the face into the vagina. The hand is then swept out of the vulva by pressure upon the forearm applied as near to the wrist as possible. The feet are then drawn downward and to the same side as before. The same hand is passed over the abdomen to the anterior shoulder, and an attempt made to pass two fingers behind the symphysis to the bend of the elbow. If the elbow is reached it is to be drawn downward across the face, as was the posterior arm. If this attempt is not at once successful, the hand should be withdrawn, and the back of the child should be rotated across the front to the other side, so that the retained arm becomes posterior. This rotation may be effected either by grasping the thorax and turning it with both hands, or by drawing the prolapsed arm forward between the labium and the back of the child. The hand which before entered the vagina then draws the feet upward and to the side, while the other hand is passed over the abdomen to the elbow and draws down the arm in the manner already described.

If the hand passed over the abdomen fails to find the posterior elbow, the feet should be grasped by that hand and drawn strongly upward and to the opposite side from that toward which they were drawn previously, and the hand which before grasped the feet should be passed along the back of the arm to the elbow. The arm must now be extracted by pressure downward across the child's face.

When the attempt is made to rotate the child so that the second arm becomes posterior, certain precautions must always be taken to prevent possible injury to the child. It must always be remembered that the articulations of the neck are so arranged that rotation of the child's head upon its body is safe only within certain limits, and that when the point of the chin is rotated to a position behind the point of the shoulder, the axis is dislocated upon the atlas with fatal results to the child. For this reason the thorax of the child should be pushed strongly upward whenever an attempt is made to rotate the child, the object being to free the head from the superior strait, so that nothing shall oppose its rotation with the body. Throughout the rotation the hands of an assistant should watch the head, so that the operator may be informed whether it follows the rotation of the shoulders or not.

Arrest of an Arm Behind the Occiput. It may happen that the head will rotate with the shoulders, but that the arm which is to be made posterior fails to follow the shoulders, being detained in its position behind the pubes by the friction against the pelvic walls. When this occurs the arm lies across the nape of the neck beneath the occiput and the symphysis. If the malposition is discovered before traction is made, prompt reversal of the movement of rotation may result in unlocking the arm and restoring it to its normal relations. If this succeeds, the reversed rotation should be continued until the arm becomes posterior—*i. e.*, through 180 degrees, when the arm can easily be extracted. Unless the first attempt unlocks the impaction, continued efforts will result, in all probability, in accomplishing little until after the death of the child, and the indication arises for immediate delivery by any method, since the child's chances have already been compromised by the delay.

The quickest and perhaps the only method which holds out any hope for the child is to deliver immediately by making direct traction upon the shoulders in the hope of forcibly extracting the arm.

This manœuvre will ordinarily result in fracture of the humerus, which is wedged in between the occiput and the symphysis, and the bystanders should be warned at the start that this must happen, and that in this way only can the life of the child be preserved.

Closure of a Constriction Ring or of an Imperfectly Dilated Os about the Neck. When in the operative extraction of a breech the operation is undertaken in the presence of a constriction ring or of an imperfectly dilated os, the stricture of the canal produced by either

of these conditions may seriously increase the difficulty of the delivery of the extended head and arms. The arms are, however, to be delivered by the same methods as described above, with additional precautions against the employment of too forcible or abrupt movements of the hand while it is within the uterus, which might result in rupture of the uterus.

The release of the head from the constriction is often, however, a matter of great difficulty. Any attempt to overcome the obstruction by forcibly dragging the head through the constriction exposes the

FIG. 158.

Dorsal displacement of the arm in footling presentations. (After BARNES.)

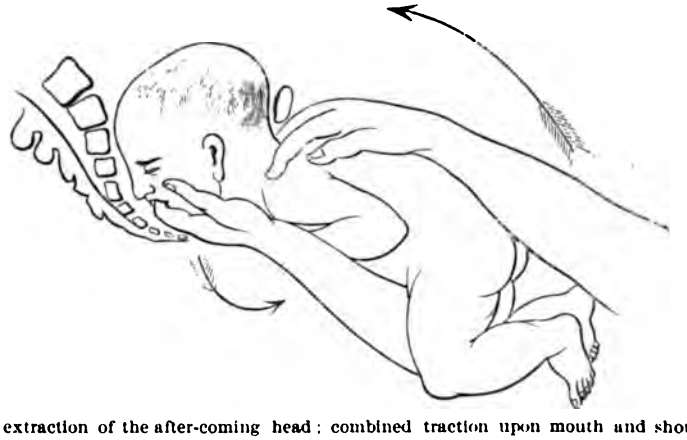
mother to the most imminent danger of rupture of the uterus. Steady traction by the combined method on the face and shoulders should be given a fair trial, and in many cases it will effect a dilatation of the constriction rapidly enough to allow the delivery of a living child. Unless a rapid trial of this method gives evidence of substantial progress, all attempts at delivery of the head by traction on the body should be abandoned, and the forceps applied at once to the head.

It is in cases of this nature that the application of forceps to the after-coming head is most often indicated, and the operator must

bear in mind the fact that each unsuccessful attempt to deliver the head endangers the life of the child in proportion to the time which is thus wasted. There can be no doubt of the truth of Lusk's observation that "the forceps will sometimes bring the head rapidly through the cervix, when traction on the feet only serves to drag the uterus to the vulva." Care must be taken in these cases that the head is not dragged by the obstacle with such rapidity that the constriction is ruptured and not dilated as it should be.

Arrest of the Head at the Superior Strait on Account of Unusual Size of the Head. Most German and American obstetricians believe that the use of combined traction upon the face and shoulders is the best method to adopt in dealing with arrest of the after-coming head in any part of the pelvis, and it should certainly be the first

FIG. 159.



Manual extraction of the after-coming head; combined traction upon mouth and shoulders (Veit's method). (PARVIN.)

method tried in a given case. Cases frequently occur, however, in which the head can be delivered with far greater ease by a rapid alternation between two or more methods than by the continued use of any one alone, and for this reason, if for none other, it is well to be familiar with all the methods which have been found of value.

The Prague Method. This manœuvre is often of service in effecting the engagement of the head and its initial descent into the superior strait. This is especially true in certain forms of contracted pelvis, and for operators whose muscular strength is inadequate to the really severe strain which is sometimes imposed upon the internal hand in the use of the combined method at the brim. It is usually inferior to the combined method after the greatest diameter of the head has passed the superior strait. Like all

methods of manual extraction, its efficiency is somewhat increased by the application of proper suprapubic pressure by an assistant.

In its performance the feet are seized by one hand and the body is drawn as far backward as the perineum allows. The other hand is hooked over the shoulders and traction is made by both hands simultaneously. (Fig. 160.) As the head enters the excavation the body is swung rapidly upward, and the remainder of the delivery is accomplished by upward traction on the feet, while the hand upon the neck promotes flexion by retarding the descent of the occiput. (Fig. 161.)

If by any clumsiness on the part of the operator the abdomen of the child is turned to the front during the manipulations necessary for the liberation of the arms, and the chin has become arrested by the symphysis, the Prague method of extraction should be used throughout.

In this case the line of the first tractions should be nearly horizontal. The occiput is drawn down into the pelvis, but owing to the resistance offered by the symphysis to the descent of the chin, extension of the head takes place until the chin slides by the symphysis.

As the head descends the body of the child should be raised gradually until, at the time when the occiput emerges from the vulva, the line of traction is nearly parallel to the mother's abdomen. (Fig. 162.)

FIG. 160.

The Prague method. First stage. (LUSK.)

The Prague method of extraction has one great disadvantage in comparison with the other methods, which lies in the fact that all the force exerted by the operator is expended upon the child's neck, and that the amount of force which the operator can safely apply is, therefore, decidedly less than may be used in the combined method.

Forceps to the After-coming Head at the Superior Strait. In difficult cases of high arrest of the after-coming head the use of forceps offers the most powerful and certain means of overcoming the obstruction. There are few cases, however, in which a skilled

FIG. 161.

The Prague method. Second stage. (LUSK.)

FIG. 162.

The Prague method. Chin to the front. (LUSK.)

operator, aided by efficient suprapubic pressure, fails to deliver by manual extraction. Such cases, nevertheless, do occasionally occur, and the forceps should always be sterilized before version is attempted, or the extraction of a breech case begun.

The operation is very difficult in many cases, and the time occupied in making the application may be of vital importance to the child; but when manual extraction fails, the forceps must be resorted to. If the use of forceps becomes necessary, the body of the child should be raised to a nearly vertical position, and the forceps passed into place upon the sides of the head under the child's abdomen. The use of axis-traction offers special advantages in these cases, and will sometimes be successful in cases in which the ordinary forceps fail.

Arrest from Extension of the Head. This condition can only occur in improperly conducted extractions, or in neglected cases in which the front of the child has been allowed to become anterior, and is due to the chin of the child catching over the symphysis. When the back of the child is anterior the head cannot become extended sufficiently to produce arrest, for the pressure of the occiput against the symphysis produces flexion. When arrest occurs from this cause, flexion may at times be restored by pressure upon the face with the internal hand combined with suprapubic pressure upon the forehead. If this fails the methods described in the last section should be employed.

Arrest at the Inferior Strait or on the Perineum. Cases in which manual extraction by the combined method fails to overcome a low arrest are extremely rare. The application of forceps and the extraction of the head by them in these cases are always very easy, and it is a good rule that when one fair trial of the combined method has failed to deliver the head, it should be delivered at once by forceps. In making the application the child's body should be raised to a nearly vertical position, and the forceps applied to the sides of the head beneath the child's abdomen.

Management of Footling Presentations. The treatment of footling cases differs in no way from that which is proper in presentations of the whole breech, with the single exception that if any indication for immediate delivery arises, there can be no question as to the choice of operation.

TRANSVERSE OR SHOULDER PRESENTATIONS.

Spontaneous delivery of transverse presentations is rarely possible at term, and in the few cases in which it has taken place the most favorable conditions have been present—*i. e.*, a very small child and an unusually large pelvis. The mechanism of spontaneous

delivery has already been described in the section devoted to version in transverse presentations.

Etiology. One of the factors which enters most largely into the causation of transverse presentations is a relaxed condition of the

FIG. 163.

Dorso-anterior presentation of the arm (S. L. A.).

FIG. 164.

Dorso-posterior presentation of the arm (S. D. P.).

uterine and abdominal walls, which allows the uterus to fall forward over the symphysis and favors the turning of the child across the pelvis.

This relaxed condition is seen practically only in women who have had several children in rapid succession, and it follows from this that transverse presentations most commonly occur among multiparæ.

Another frequent cause of this malpresentation is contraction of the pelvic brim. The head of the child not being able to enter the pelvis readily, lodges in one of the iliac fossæ, while the intermittent

FIG. 165.

Chiara's frozen section, representing arrested spontaneous evolution. (PLAYFAIR.)

uterine contractions tend to keep it there and gradually depress the trunk. Strong lateral flexion of the trunk may occasionally result in converting the presentation into a breech, gradually bringing the breech and legs into the pelvic cavity. In most cases, however, the shoulder is forced downward and wedged into the pelvic brim. The arm may be prolapsed into the vagina, or may be folded upon the body of the child in such a manner that it serves to increase the bulk of the tissues which block up the entrance to the pelvis.

Prognosis. The prognosis for both mother and child in transverse presentations is entirely dependent upon the stage of labor at

FIG. 166.

Spontaneous evolution. First stage. (LEISHMAN.)

FIG. 167.

Spontaneous evolution. Second stage. (LEISHMAN.)

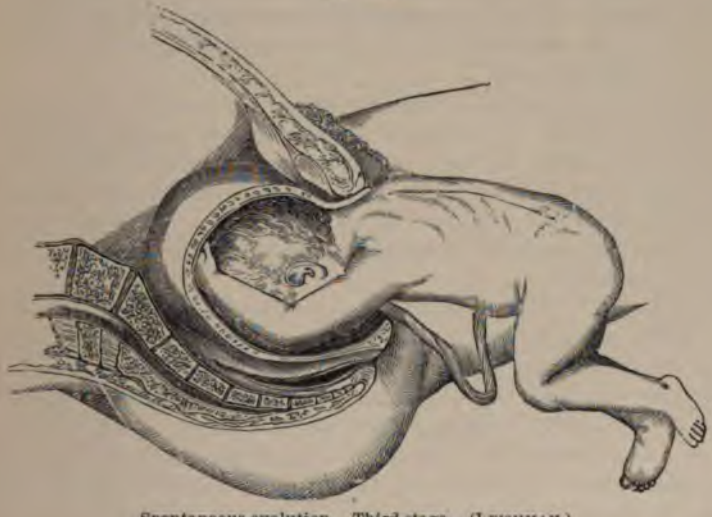
which the malpresentation is recognized. If the diagnosis is made at the beginning of labor, before the rupture of the membranes, the

prognosis for the mother is no worse than in normal labor, and the prospects of the child are but slightly changed. When, however, the diagnosis is not made until retraction of the uterus sets in, delivery is only possible by means of internal podalic version, which necessarily subjects the child to serious risks, or by a destructive operation which sacrifices the child in the interests of the mother.

Management of Transverse Presentations.

If, at the time when the diagnosis is made, the membranes are unruptured and the presenting part is unengaged, four distinctly minor operations are possible: external and bipolar cephalic version,

FIG. 168.



Spontaneous evolution. Third stage. (LEISHMAN.)

and external and bipolar pelvic version. These operations are to be preferred in the order given. If bipolar version fails, the immediate performance of internal podalic version is indicated, since delay will only serve to further compromise the safety of both mother and child.

If the membranes are ruptured and the presenting part engaged, internal podalic version is the only conservative operation possible, but the version must always be preceded by raising the presenting part, and should only be performed in the interests of a living child, unless the operation promises to be easy.

If the condition of the uterus is such that version is thought to be too difficult, or too dangerous for the mother to be justifiable even to save the child, or if, the child being dead, the condition of

the uterus offers any obstruction to the easy performance of version, decapitation or exenteration must be resorted to in the interests of the mother.

The detailed descriptions of the different operations are included under the chapters on Version and the Destructive Operations, and will not be repeated here.

PROLAPSED EXTREMITIES.

Presentation of the Head and Hand. Mechanism and Prognosis.

When a hand enters the pelvic brim at the same time as or in advance of the head, it is most commonly placed at one end of the temporal diameter of the head. Delay, if not total arrest of progress, usually results from its presence in this abnormal situation, on account of the increase in size of the presenting part. Rotation may be interfered with.

The prognosis varies in different cases. The delay may be slight in some cases, and if the pelvic diameters are ample, spontaneous delivery may occur in rare instances, the descent of the hand and arm being prevented by friction against the pelvic walls, while the descent of the head goes on. If serious delay or arrest of progress ensues, the prognosis becomes that of the operative treatment which may be necessary.

Management. The presentation will, in the majority of cases, cause sufficient delay to be discovered early by a high examination. If the membranes are intact at the time the discovery is made, they should be ruptured. Patient and prolonged attempts should be made in all cases to replace the hand above the head by manual efforts. If the head and arm are not impacted in the superior strait, these efforts will usually be successful, and the delivery may then be left to nature, or forceps may be applied in accordance with the indications.

If, however, the attempts at replacing the prolapsed hand fail, forceps should be applied to the head. The friction against the pelvic wall will usually delay the descent of the hand, while the head advances under the force of the forceps. In making the application great care must be taken to avoid including the hand, wrist, or forearm, in the grasp of the blades, for such an error would surely result in the production of one or more fractures.

In the less common cases in which the hand is prolapsed by the side of the occipital end of the head, the descent of the occiput is frequently delayed by its presence, while the comparatively unobstructed sinciput descends. This results, of course, in the production of extension, which may even go as far as the establishment of a brow presentation.

If the accident is detected before marked extension has occurred, it should be treated by an attempt to replace the hand, followed, if unsuccessful, by the application of forceps or by version.

If marked extension is already present at the time when the diagnosis is made, the attendant should endeavor to replace the hand and flex the head manually, unless prolonged labor has already effected the marked moulding of the head, which occurs in neglected brow presentations. If this is the case, or if the attempt at reposition of the hand fails, version is the operation of choice, unless it is contraindicated by the condition of the uterus.

Presentations of the Head and Foot.

This presentation is decidedly more rare than that of the head and hand. The consequences and treatment are identical.

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PART V.

PATHOLOGY OF LABOR.

CHAPTER XXI.

DEFORMED PELVES. INTRAPELVIC TUMORS. ATRESIA.

DEFORMED PELVES.

THE consideration of the effect produced by contraction of one or more of the pelvic diameters on the mechanism of labor, and the treatment which it necessitates, is one of the most important subjects in modern obstetrics, and one which deserves the most careful attention.

As ordinarily employed the term contracted pelvis is understood to imply that sufficient shortening of one or more of the pelvic diameters exists as to render delivery by natural means difficult or impossible and the intervention of obstetrical art necessary. This is not, however, a broad enough definition. The term, when properly used, includes not only those cases in which sufficient contraction of the pelvic diameters exists to obstruct delivery, but also all the cases in which the mechanism of labor is affected by the diminution of the pelvic space, and it is in this broader sense that the term will be used throughout this chapter.

Until a comparatively recent date the belief has existed among most American physicians that deformed pelvis is a rare condition among American women, although a fairly common one in the European nations. This, in spite of the fact that the existence of a large foreign population exists in all of our large cities, has induced such a wide-spread indifference, even among the physicians whose practice lies among our foreign population, that it has been left to a few men, who have refused to accept hearsay evidence, to prove by their careful and painstaking investigations that deformity of the pelvis, far from being an uncommon condition among our native-born women, is an exceedingly common one. According to the statistics which have been published by different observers, it would seem that the frequency of the occurrence of contracted pelvis

varies widely with the locality in which the observations have been made. Although it is undoubtedly true that the percentage of contracted pelves may vary somewhat according to the locality, and also with the nationality of the patients from whom the statistics are taken, on account of the different conditions of life under which they exist, it is more probable that the wide variations which occur in the following statistics are due to differences among the different observers in their definitions of contracted pelvis.

In different localities of Germany the percentage of contracted pelvis varies according to different observers between the extreme limits of 7.9 per cent. and 24.3 per cent.

In Austria contracted pelvis is apparently a much less common condition, varying according to the figures of different observers from 2.15 per cent. to 7.8 per cent.

In France the figures vary from 5 per cent. (Pinard) to 6 per cent. (Tarnier).

In Russia the reported percentages are much less, and the figures, 1.2 per cent. to 5.5 per cent., would seem to indicate that contracted pelvis is comparatively rare among the Slavonic races.

In America there have been as yet too few observers to indicate more than that contracted pelvis is a comparatively common condition. The statistics of Williams and Dobbin show 13.1 per cent. in 1000 cases. In these cases pelvic deformity was observed in 7.14 per cent. of the white, and in 19.83 per cent. of the colored women who came under their observation.

Cross found contraction to exist in 7 per cent. of the cases he examined.

Flint, on the other hand, among 10,000 cases, only found 1.42 per cent. showing contraction, but as 70 per cent. of his cases were of Russian birth, his statistics represent the condition among Russian rather than among the American women.

In this country the scientific study of contracted pelvis is comparatively new, and the observations are as yet too few in number to form the basis of definite conclusions, but it is probable that future investigations will show that if the term contracted pelvis is so defined that it includes all cases in which the normal mechanism of delivery is altered by the pelvic narrowing, the true percentage of the frequency of contracted pelvis will be found to be very close to 10 per cent.

It must, therefore, be admitted that the study of contracted pelvis assumes a position of considerable importance, and that it is the duty of every physician to use such means as may enable him to recognize the abnormality at a time when appropriate treatment can be instituted with fair hope of success, instead of waiting to have it forced on his notice by the failure of nature to perform her task unaided. The attempt to conduct labor in such cases without

a knowledge of their peculiarities often leads to an unnecessary loss of fœtal life and injury to the maternal tissues. It is, therefore, evident that a competent knowledge of these malformations is of great importance to all obstetricians, no matter among what class of patients their practice may lie.

DIAGNOSIS. Unfortunately there are few external peculiarities which can guide us to a suspicion of the existence of pelvic deformities. So far as such warnings exist they are to be found in the excessively small size of the patient or in the presence of narrow hips in tall, slender women. Relative shortness of the limbs; lameness due to shortening of one leg; abnormal spinal curvature, whether lateral or antero-posterior; and a history of rhachitis during childhood, all suggest the possibility of co-existent pelvic deformity.

During labor there may be observed several conditions of much greater significance in pointing to the existence of contraction.

In primiparæ the head often remains high and it may be difficult to reach the presenting part, whereas in primiparæ with normal pelves the presenting part usually enters the pelvis some time before labor begins.

The non-descent of the presenting part prevents the complete occlusion of the lower uterine segment, and if the membranes are elastic, this results in the protrusion of a long sausage-like bag through the partly dilated os. When rupture of the membranes occurs, a great part, if not the whole, of the liquor amnii is discharged at once, and this is usually followed by more or less recontraction of the cervix, which is no longer subjected to the pressure of the intra-uterine forces, since the head is unable to press against it. If the head is found on examination to be entering the brim with its long diameter in the transverse diameter of the pelvis, instead of in one of the oblique diameters, the existence of a flat pelvis is shown, for only in this condition does the head enter in this way.

If sufficient disproportion exists between the size of the head and the size of the pelvis to form an efficient obstacle to progress, the continuance of active labor without advance is a condition which renders the patient peculiarly liable to the formation of constriction or retraction rings. After these once appear little can be hoped for from a longer continuance of labor unaided by operative measures.

Malpresentations of the fœtus and premature rupture of the membranes, with prolapse of the cord, are relatively common in cases of contracted pelvis, and should lead to a suspicion of the condition. The only sure means of diagnosing pelvic contraction consists in careful pelvimetry in every case which comes under observation. If the reason for taking careful measurements be fully explained to the patient, no objection will be made to the procedure.

"For scientific purposes every patient should be carefully measured during the last two months of pregnancy, in order that the true frequency of the abnormality in this country may be accurately

FIG. 169.

Collyer's pelvimeter.

ascertained; for ordinary work, however, it is only necessary to measure certain cases, which may be separated into three classes: 1. All women who by their small size, or the existence of some deformity, give rise to the suspicion of the existence of a pelvic

FIG. 170.

Measuring the intercristal diameter. (JEWETT.)

narrowing. 2. All multiparæ with a history of previous difficult labors. 3. All primiparæ in whom at the beginning of labor the presenting part is found above the brim.

Pelvic Measurements. The pelvic measurements which are ordinarily taken are five in number. Of these four are external measurements.

External Measurements. The external measurements are the distances between the iliac crests and between the anterior superior spines, the external conjugate, and the oblique diameters. These diameters can only be measured accurately by means of a pelvimeter. (Fig. 169.) In measuring the transverse diameters the patient should lie in the dorsal position. The distance between the anterior superior spines is measured by placing the tips of the instrument against the anterior superior spines just external to the origins of

FIG. 171.

Measuring the external conjugate. The dimples corresponding to the posterior superior spines of the ilium are shown in the figure. (JEWETT.)

the recti femoris muscles, and is normally, in American women, about 25 centimetres, or 19 inches.

The distance between the iliac crests is ascertained by placing the points of the instrument against the external margins of the crests, and moving them backward and forward until the point of greatest separation is found. This diameter averages about 28 centimetres, or 11.25 inches.

The other measurements are taken with the patient lying on one side or the other as may be the most convenient, with the thighs somewhat flexed on the body. The external conjugate is measured by so adjusting the pelvimeter that one point is pressed against the upper edge of the symphysis pubis, while the other rests in the

median line just below the spine of the fifth lumbar vertebra, this being the point which gives the smallest measurement obtainable from any point in the median line in this immediate neighborhood. The external conjugate averages about 20 centimetres, or 8 inches. The length of the true conjugate is calculated from the external conjugate in the average case by the subtraction of 9 centimetres, which approximates the thickness of the bones and soft parts included in the external measurement in the average case, but is rendered of little absolute value by the extreme variations which must be expected in the amount to be subtracted in different cases.

The external oblique diameter is measured by placing one of the points of the pelvimeter against one of the anterior superior spines, while the other point is placed against the posterior superior spine

FIG. 172.

Manual method of measuring the diagonal conjugate. (JEWETT.)

on the opposite side. The measurement is normally about 22 centimetres, or 8.75 inches. The distance between the spines and the external oblique diameters are the only external measurements which can be taken with certainty, since they are the only measurements which are not liable to considerable variations with the varying stoutness of the patient.

Internal Measurements. The only internal measurement which is easily taken is the length of the diagonal conjugate, from which the true conjugate can be approximately obtained by calculation. This measurement is made in the following manner: The patient is placed on her back with the thighs flexed. The operator passes two fingers into the vagina and upward to the posterior cul-de-sac, when, by gentle pressure onward and as much upward

as possible, the tip of the middle finger is made to reach the promontory of the sacrum. The edge of the index finger is then pressed closely against the symphysis, and the point of contact is marked off by the nail of the index finger of the other hand. The fingers are then withdrawn from the vagina with as little alteration of their position as possible, and the length of the diagonal conjugate is ascertained by measuring the distance marked off on them. In the normal case this should be from 11 to 12 centimetres, or from 4.50 to 4.75 inches.

The fingers of the half hand are then made to palpate the entire internal surface of the true pelvis, so far as it can be reached, and to note especially the length and the degree of inclination of the

FIG. 173.

Johnson's method. Hand from thumb to little finger measures four inches. (HERMANN.)

FIG. 174.

Hand measures three and one-half inches. (DAVIS.)

inner surface of the symphysis and the height of the promontory above the brim, in order to gain an accurate estimation of the shape of the triangle from which the true conjugate is to be calculated.

It has been found by experience that the amount which should be subtracted from the diagonal conjugate to obtain the conjugata vera varies ordinarily between one-half and three-quarters of an inch. It is evident that the difference in length between the diagonal and true conjugates must grow less as the inclination or length of the symphysis decreases and with a diminution in the height of the promontory, and increase as these characteristics are reversed.

The exact amount, however, to be deducted in the individual case must depend upon the judgment and experience of the obstetrician.

When the inclination of the brim and the height of the promontory are normal, one-half inch should be subtracted from the diagonal to give the true conjugate if the length of the symphysis is less than one and one-half inches, and three-quarters of an inch if it is over that length.

Internal and external pelvimetry combined with careful palpation of the interior of the pelvis establishes the following points: 1. The presence or absence of pelvic deformity. 2. The type of the deformity which is present. 3. The amount of shortening of the pelvic diameters which the given case presents.

FIG. 175.

Hand measures three and a quarter inches. (DAVIS.)

FIG. 176.

Hand measures three inches. (DAVIS.)

External measurement of the pelvis is by far the less important method of examination, and is of practical value only to the degree that a marked variation in the length of the various measurements, or a change in the relations which they normally bear to each other, points to the existence of a similar alteration in the internal measurements of the pelvis, and thus furnishes a hint as to the presence of a greater or less degree of deformity of the true pelvis. This hint may be of value even as regards the size of the pelvis in the given case, if the bones of the false pelvis are of average thickness in the given individual; but if they are of greater thickness than normal the external measurements of the pelvis may be normal when the internal diameters are markedly diminished, and the reverse is also true.

In regard to establishing the type of deformity present, the external measurements in combination with the general conformation of the false pelvis may be of considerable value, because the shape of the true and false pelvis usually correspond more or less closely; for example, if the measurements show a general shortening in all diameters, and the configuration of the false pelvis is round with an exaggerated curving of the iliac crests, it is probable that a general contraction of the true pelvis in all diameters is also present, although this can only be definitely ascertained and its degree established by internal examination.

The only internal measurement which is of importance and which can be accurately obtained is the diagonal conjugate, from which the true conjugate can be readily calculated. This measurement is extremely important, as it represents the actual amount of pelvic space which exists, and its measurement, combined with careful manual exploration of the interior of the pelvis with the half hand, to learn what relation the transverse and oblique diameters bear to the conjugate, definitely determines the existence or not of pelvic contraction, as well as the type and degree of deformity which is present.

FIG. 177.

Hand measures two and a half inches. (DAVIS.)

Type of Deformity. The principal forms of contracted pelvis which are found in this country are the justo-minor and flat pelvis. Since, however, all types of contracted pelvis have been found among both our foreign and native-born women, the rarer forms must also be studied, especially the common form of oblique pelvis which often results from disease of the hip in early life.

I. The Justo-minor or Generally Contracted Pelvis.

This form of deformed pelvis, though comparatively uncommon among European nations, is by far the most common among our American women.

The external configuration of the patient and her antecedent history ordinarily give little clue to its presence. The diagnosis is usually to be made only by careful external and internal pelvic measurement.

The principal characteristics are the following: On external measurement all the diameters are symmetrically decreased, and the curve of the iliac crests is abnormally rounded; internal examina-

FIG. 178.

FIG. 179.

Characteristics of the justo-minor pelvis (exaggerated). The dotted line represents the normal pelvis.

FIG. 180.

Justo-minor pelvis. (HIRST.)

FIG. 181.

Adult pelvis retaining its infantile type. (PLAYFAIR.)

tion shows the promontory to be high and the sacrum straight and long; the symphysis is long and the angle of its inclination to the brim is increased; the inlet is round in shape, the sacrosciatic notches are shallow, and the axis of the pelvis is long.

FIG. 182.

FIG. 183.

Characteristics of the simple flat pelvis (exaggerated). The dotted line represents the normal pelvis.

During labor the head enters late, in a position of excessive flexion. The obstruction is not limited to the superior strait, but continues throughout the pelvis. Rotation of the occiput to the arch sometimes fails to occur, on account of the decreased inclination of the inferior pelvic planes.

II. The Flat Pelvis.

This variety of malformation is most common among the Irish and German portions of our population, but is by no means very rare among our native women.

In negresses a peculiar and very shallow, flat pelvis, with marked contraction of the external conjugate in particular, is not uncommon. The dystocia which results among them is, however, far less in proportion to the diminution of the pelvic diameters than with any other race we have to deal with, probably owing in a large measure to the small size and great moulding power of the fœtal head, for the children are apt to be small and poorly nourished, and the cranial bones soft. In flat pelves the interspinal and intercristal diameters approximate to each other in length, and the external conjugate is usually somewhat lessened—*i. e.*, the general curve of the iliac crests is straightened and flaring. Internal palpation shows the transverse space to be comparatively ample, and the sacro-iliac notches of about normal depth. The symphysis is short, and the angle of its inclination to the brim is normal, or, perhaps, less than normal. The promontory is low and the pelvis, as a whole, is

short. The inferior strait is little if at all diminished in size, and the obstacle to labor is almost wholly at the brim.

The head enters the pelvis with its long diameter opposed to the transverse diameter of the pelvis, and commonly passes the brim in

FIG. 184.

FIG. 185.

Characteristics of the generally contracted, flat pelvis (exaggerated). The dotted line represents the normal pelvis.

a more or less extended position, but flexion recurs after the brim is passed, and subsequent progress is normal.

FIG. 186.

Flat rhachitic pelvis. (Mütter Museum, College of Physicians of Philadelphia.)

In breech presentations or after version in flat pelves the head enters transversely in a somewhat extended position, and the narrowed conjugate receives the bitemporal diameter, while the longer

biparietal diameter corresponds to the greater space opposite an iliosacral notch. Traction upon the body causes slight extension of the head until the resistance of the conjugate is overcome, after which flexion must again be re-established before the head can pass through the excavation and the inferior strait.

The Rhachitic Flat Pelvis. In certain parts of Europe the rhachitic type of pelvis is very common. The statement has often been made that it never occurs in this country except among our foreign-born population. This statement is not true, however, and the rhachitic type of pelvis occurs in a distinct proportion of cases among our native-born women, being relatively much more common among colored women.

The external configuration of the woman may or may not suggest the presence of rhachitic deformity. Inquiry into the early history of the patient will, however, generally give the requisite clue. In marked cases the appearance of the patient is characteristic; the

FIG. 187.

Rhachitic pelvis, with backward depression of symphysis pubis. (PLAYFAIR.)

size is dwarfed; the abdomen prominent; the gait clumsy; the sacrum is flattened externally in outline; a variable amount of spinal deviation may be present. External pelvimetry will yield, as a rule, the characteristics of a flat pelvis. The pelvis will often be found to be asymmetrically contracted, but the most marked characteristic of the rhachitic type is an extreme flattening due to the downward sinking of the sacrum, the result being approximation of the promontory to the symphysis. This antero-posterior narrowing may be compensated by a slight increase in the transverse diameter, but this is not the rule in the typical rhachitic pelvis; in fact, the reverse is usually true.

The pubic arch is usually widened. The result of these various changes is a pelvis with contraction at the brim, while the outlet is normal or slightly widened. In extreme cases the approximation of the sacral promontory to the symphysis may be so close as to practically divide the brim of the pelvis into two portions. The importance of the recognition of this type of pelvis before labor begins

is obvious. In its minor degrees the rhachitic cannot be distinguished from any other form of flat pelvis.

III. Oblique Contraction of the Pelvis from Early Disease of the Hip Joint.

Although the forms of contracted pelvis which have just been described are the more common forms of pelvic deformity, occurring as they do in minor degrees in many cases, the obliquely contracted pelvis following hip disease in early life deserves to be included among the more common deformities, since, although it is less frequent in actual numbers, it is almost as important from the stand-point of the major operations.

FIG. 188.

Obliquely contracted pelvis from coxalgia: coxitis on right side, deformity on left. (Mütter Museum, College of Physicians of Philadelphia.) (HIRST.)

The oblique deformity of the pelvis which results from hip disease conforms to one of two types. In one the obliquity results from the upward, backward, and inward displacement of the innominate bone on the healthy side, due to the pressure of the femur against the pelvis, the weight of the body being supported mainly by the sound leg. Unless this form of oblique contraction is associated with a rhachitic deformity it usually causes little interference with delivery. In the other type of contraction which results from hip disease the deformity is also oblique, but the bone on the diseased side encroaches on the pelvic canal. This results from an arrest in development on the corresponding side of the pelvis. The sym-

physis is displaced toward the affected side, the sacral ala is usually atrophied and the sacro-iliac joint ankylosed, and the whole affected side of the pelvis is flattened. This is by far the most serious form of contraction, and, except in the minor degrees of the deformity, usually necessitates an abdominal delivery.

These constitute the common forms of contracted pelvis with which the practitioner will ordinarily come in contact. As a rule, the oblique pelvis and the rhachitic in its more exaggerated forms are the only ones in which the configuration of the patient conveys any definite suggestion of pelvic deformity. The forms which are now to be considered are of rare occurrence, in English-speaking countries, at least, and in them pelvic deformity is, as a rule, suggested by the appearance of the woman.

IV. Transversely Contracted Pelvis. (Roberts Pelvis.)

This is an uncommon variety of pelvic deformity, only about thirteen cases being reported. The chief internal characteristic of this pelvis is its being practically divided into two halves antero-posteriorly, owing to the progressive narrowing of the transverse

FIG. 189.

The Roberts pelvis. (HIRST.)

diameter from the brim to the outlet. The conjugate diameter, on the other hand, is normal or nearly so. The sacrum sinks markedly into the pelvis, the posterior superior spines are close together, and the iliac bones project greatly posteriorly. Delivery per vaginam is impossible to a patient with a pelvis of this form, unless the contraction is very slight.

V. The Kyphotic Pelvis.

In the kyphotic pelvis the upper part of the sacrum is thrown backward in compensation for a kyphotic spinal deformity above.

The diagnosis of the existence of this form of pelvic deformity can readily be made on inspection of the patient and from the antecedent history. Pott's disease is, of course, the etiological factor in producing the pelvic contraction, and according as the spinal deviation is in the dorsal, lumbar, or cervical region, the effect it produces on the pelvis varies. In general, the characteristics of the kyphotic pelvis are the following: The true conjugate is lengthened, the transverse diameter is diminished at the brim to a certain extent, and this narrowing is further increased in the excavation and at the outlet; the promontory of the sacrum is carried upward and backward; the lower part of the sacrum is thrown forward and inward; the pubic arch is usually narrowed; and the chief difficulty is at the outlet.

VI. The Scoliotic Pelvis.

In the cases of contracted pelvis which depend upon lateral curvature of the spine it is essential to distinguish between two types whose characteristics are distinct—the rhachitic and the non-rhachitic.

In the non-rhachitic scoliotic pelvis the diminution of the diameters is seldom sufficiently marked to prevent delivery at term. The chief characteristic of the pelvis is a flattening of that side of the pelvis toward which the spinal column deviates. As a result, one of the oblique diameters is shortened, while the other may be unchanged. The brim is the chief seat of the contraction.

The rhachitic form, on the other hand, presents alterations which differ in degree, according as the rhachitic changes took place in infancy or later. The striking characteristics are: Considerable shortening of the true conjugate, due to forward projection of the promontory; asymmetry of the two sides of the pelvis exists to a greater or less degree as more or less lateral curvature of the spine is present; and the symphysis pubis is deviated away from the spinal curvature.

The pelvic inlet is narrowed on the side of the scoliosis and widened on the other side, and at the outlet the reverse is the case. There is also some antero-posterior narrowing at the outlet.

VII. Spondylolisthetic Pelvis.

This form of contraction results from the sliding downward of one or more of the lumbar vertebræ on the first sacral vertebræ, with the result that a false promontory is formed anterior to and below the true one. In the majority of specimens which have been examined spinal caries seems to have been the causative factor. The recognition of the deformity is usually easy. The contour of the lumbar spine suggests deformity, and an internal pelvic examination reveals the nature of the deformity.

VIII. Funnel-shaped Pelvis.

This form of pelvic contraction is exceedingly rare, and needs only passing mention. There is slight contraction of all the diameters at the inlet, and this narrowing increases progressively to the outlet. Recognition is easy if internal pelvimetry is not neglected.

FIG. 190.

Spondylolisthetic pelvis: 4, fourth lumbar vertebra; 5, fifth lumbar vertebra. (KILIAN.)

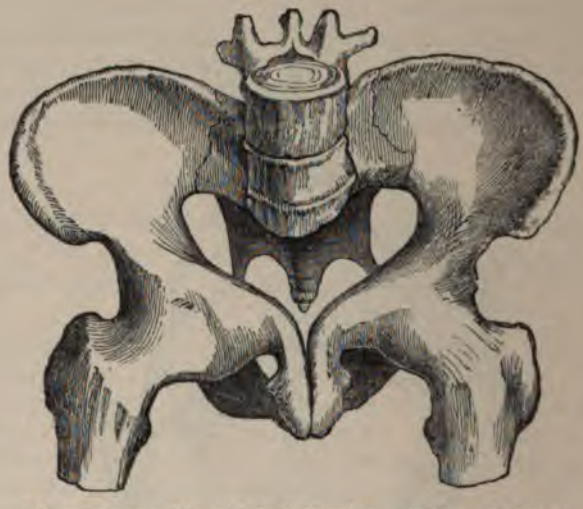
IX. Osteomalacic Pelvis.

Osteomalacia, which causes this deformity, usually develops after conception, first manifesting itself, as a rule, during the pregnant state. The early stages of the disease are characterized by acute pain in the limbs and pelvis. This symptom appearing during pregnancy should suggest the development of the disease, and should call for careful internal pelvic mensuration with the entire hand. The disease is very rare in America, but does occur. The etiology is not definitely known. Only in advanced cases will the external configuration of the woman suggest the pelvic deformity.

The characteristics of the osteomalacic pelvis are: softening of the bones in general; the sacrum is small and sinks into the pelvis, coming into more or less close approximation with the symphysis; the lumbar vertebræ approach the pelvic brim; the pubic rami bend inward, the pubic angle being sharply acute and shaped like a beak.

The transverse diameters are diminished, that between the crests becoming at times shorter than that between the spines. As a rule, the outlet is narrower than the inlet. The conjugate may be only slightly narrowed, but the transverse is considerably shortened at the brim, and more so in the excavation and at the outlet.

FIG. 191.



Osteomalacic pelvis, with beak-like shape of pubes. (BARNES.)

In the slighter degrees of deformity due to osteomalacia, internal pelvimetry with the entire hand is essential, not only for absolute diagnosis, but also for determining the extent to which the softened pelvic bones will yield to pressure. The latter point is very important in determining the treatment of the case.

X. The Oblique Ovate Pelvis.

This form of pelvic deformity was first described by Naegelé. In the minor degrees the woman shows no external signs. The broad characteristics of the pelvis are the diminution of one oblique diameter, associated with ankylosis of one of the sacro-iliac synchondroses. The pelvis is asymmetrical. One side of the sacrum is comparatively undeveloped and the bone is pushed toward the affected side.

The symphysis is obliquely opposite the sacrum, and the pubic arch is narrowed. The true conjugate is, as a rule, longer than the normal. The transverse diameter is narrowed at the brim, and this increases progressively toward the outlet. Pelvimetry will reveal the asymmetry. In aggravated cases the external configuration shows the

existence of pelvic deformity; the woman limps; one hip is higher than the other; and the deviation of the symphysis is marked.

TREATMENT OF DEFORMED PELVIS. *Variation in the Size of the Child.* If the heads of all children at term were of uniform size and consistency, the division of contracted pelvis into classes would be easy, and the determination of the treatment to be adopted in the individual cases would become a mere matter of pelvic measurement. In practice, however, the indications for treatment vary widely in accordance with the size and ossification of the individual head. This is nothing more than is to be expected when it is remembered that the normal variation in the size of the child at term can hardly be stated within narrower limits than from five

FIG. 192.

Oblique deformity of Naegelé; disease on left side. (BARNES.)

and one-half to twelve pounds, and that the consistency of the cranial bones may vary from that of stiff cardboard to almost the rigidity of a metal plate. The width of the interosseous sutures of the head is also liable to great variations, so that in one case, the sutures being wide and the bones soft, the head moulds readily, and will pass through a much more contracted pelvis than another head, in which the sutures are more nearly closed and the bones more rigid.

The variation in the size of premature children of the same age is, perhaps, even greater than obtains at term.

The varying results of labor in pelves of a given size and shape, in accordance with the differences in the size of the child and the ossification of its head, can best be shown by a careful study of the

following cases which have been tabulated in accordance with the size and nature of the contracted pelvis.[1]

In this series the diagonal conjugate is taken as the standard for the classification of the pelves according to size, as the estimation of the true conjugate varies with each observer.

Generally Contracted or Justo-minor Pelves. Forty-one cases with a diagonal conjugate of from 10.75 to 11.50 centimetres resulted in 30 spontaneous deliveries, 6 forceps, 2 versions, 2 operative extractions of the breech, and 1 decapitation on a child which was already dead, the uterus being in a state of tonic contraction; 15 cases, whose diagonal conjugate varied from 10 to 10.75 centimetres, gave 10 spontaneous deliveries, 2 forceps, 2 versions for prolapsed cord, and 1 destructive operation on a child which was dead when the patient first came under observation; 1 case with a diagonal conjugate of 9.75 centimetres came to high forceps and was delivered of a living child.

Flat Pelves. Fourteen cases with a diagonal conjugate of 10.75 centimetres or over resulted in 9 spontaneous labors, 1 forceps operation, 3 versions (craniotomy on the after-coming head being necessary in 1 case), and 1 breech extraction; 8 cases in which the diagonal conjugate measured 10 to 10.50 centimetres gave 6 spontaneous labors and 2 versions, with no fœtal mortality.

Rhachitic Pelves. Eleven cases of rhachitic pelvis whose diagonal conjugate measured 10.75 centimetres or above resulted in 3 spontaneous deliveries, 5 forceps operations, 2 breech extractions, and 1 version; 5 cases with diagonal conjugates of from 10 to 10.50 centimetres resulted in 2 spontaneous labors, 1 forceps, and 2 versions; 3 cases with diagonal conjugates of 9.75 centimetres or under gave 1 forceps operation, 1 craniotomy, and 1 symphysiotomy.

Irregular Pelves. One case of osteomalacic pelvis with a diagonal conjugate of 11 centimetres resulted in a very difficult craniotomy, the child being dead when the case first came under observation.

Three cases of obliquely contracted pelves associated with coxalgia gave 1 forceps operation, which resulted in the death of the child, and 2 difficult versions with living children.

One obliquely contracted pelvis with congenital contraction of the right hip, with a diagonal conjugate of 10.5 centimetres, resulted in spontaneous delivery, as also did 1 case of flat pelvis with congenital dislocation of both hips, whose diagonal conjugate measured 11.5 centimetres.

[1] Collated from "The Management of Labor in Abnormal Pelves," by Edward P. Davis. "The Operative Treatment of Labor Complicated by Pelvic Deformities," by G. W. Dobbin, and "The Frequency of Contracted Pelves in the First Thousand Women Delivered in the Out-Patient Department of the Johns Hopkins Hospital," by Whitridge Williams.

One spondylolisthetic pelvis with a diagonal conjugate of 9.5 centimetres resulted in a symphysiotomy.

The study of this collection of cases shows plainly that with pelves of a given size the results vary extremely, and that a prediction as to the probable outcome of labor in a given case of contracted pelvis must take into account not only the degree of a pelvic contraction, but also the nature of the deformity and the approximate size of the child.

The duty of the obstetrician when confronted by a case of contracted pelvis is then to make careful pelvic measurements and to diagnose the type of the deformity with great care, and thus determine what operative procedures are indicated in the interest of both patients, provided that the child is of average size.

He must then estimate the size of the child as closely as possible, and modify his plan of treatment in accordance with his opinion of its size.

Estimation of the Size of the Child. Owing to the great variations in the size of children at the same period of development it is impossible to form any definite idea of the size of the child of a given age, and the most that can safely be said is that the average weight of a child at a given time is known, but that a given child may be decidedly larger or smaller than the average.

Knowing the period of development which a child has reached, the attempt should be made to ascertain how closely the child corresponds with the average size for its age. This is to be done by bimanual palpation of the body through the abdominal walls, but it is impossible to obtain in this way anything more than a very indefinite idea of the child's size and weight. The thickness and rigidity of the abdominal and uterine walls in a given case, and the amount of liquor amnii present, all tend to make accurate estimation of the size of the child impossible. An approximate estimation may be made, however, and the size of the biparietal diameter which corresponds to the estimated weight may be learned by reference to the following table, though it must not be forgotten that the size of the diameters of the head is not free from variations in children of a given size and weight.

Weight of child.	Size of biparietal diameter.	Average period of pregnancy at which these weights and measurements are obtained.	Corresponding conjugate (true) in justo-minor pelves.	Corresponding conjugate (true) in simple flat pelves.
3 -3½ lbs.	2¾-3 inches.	32 weeks.	3 inches.	2¾ inches.
3½-4 "	3 -3¼ "	34 "	3¼ "	3 "
4 -5 "	3¼-3½ "	36 "	3½ "	3¼ "
5 -6 "	3½-3¾ "	38 "	3¾ "	3½ "

In rhachitic pelves the conjugate diameter which is appropriate to a given head varies from that appropriate to a given head in justo-minor and simple flat pelves, in accordance with the amount of transverse contraction present.

More important than the size of the head in determining the proper treatment of the case is its consistency, because if the cranial bones are soft and yielding the head will pass through a much smaller pelvis than if they are rigid. The probable consistency is to be estimated by bimanual palpation, both through the abdominal walls and with one hand in the vagina.

If the patient is a multipara the results obtained by physical examination should be contrasted with the history of her previous labors.

As a rule, the size of the child increases slightly in successive pregnancies, except that if the birth of a girl follows that of a boy, the size may be a little less or about the same. Repeated attempts at estimating the size of the child will give much more definite information than a single examination.

The determination of the probable amount of disproportion between the individual head and pelvis is always a matter of great difficulty, and the responsibility of the decision which results from its determination is so great that a formal consultation should be called in such a case. If doubt exists after such a consultation as to whether the head can pass through the pelvis or not, the test of labor should be applied—*i. e.*, in those cases in which the necessity for an abdominal delivery is probable but not absolutely certain, the patient should be allowed to go a few hours in strong labor, careful watch being kept of the rate of progress, the moulding of the head, the effect on the fœtal vitality, etc., and treatment adopted in accordance with the indications which are noted.

Classification of Contracted Pelves. The treatment of deformed pelves is determined, first, by the degree of contraction, and, second, by the type of deformity present, the irregular types, if the contraction is at all marked, requiring operative delivery more often than the regular types of contraction. Contracted pelves are conveniently divided into three classes, according to the degree of contraction present:

(*a*) Those pelves in which the diminution of space is so slight that the delivery of a living child at term by normal labor or by the ordinary obstetrical operations is probable, and in which if these fail craniotomy is likely to be easy.

(*b*) Pelves so much contracted that the delivery of a living child at term is improbable or impossible, and that extraction after craniotomy would probably be difficult or dangerous, but which affords sufficient space to permit the probable delivery of a premature living child.

(*c*) Cases in which the contraction is so extreme that the delivery of a living child, even though premature, is impossible, that symphysiotomy is contraindicated, and that the extraction of any child after craniotomy would be very difficult and dangerous.

With children of average size—*i. e.*, between six and seven pounds in weight—it may be stated, as a rule, that justo-minor pelves whose true conjugate exceed $9\frac{1}{2}$ centimetres, and simple flat pelves with true conjugates of over $8\frac{1}{2}$ centimetres, may be placed in the first class. Justo-minor pelves of from $7\frac{1}{2}$ to $9\frac{1}{2}$ centimetres in the conjugate, and simple flat pelves of from $6\frac{1}{4}$ to $8\frac{1}{2}$ centimetres, belong in Class B. Pelves under these measurements belong in Class C. Rhachitic pelves are to be classified with the justo-minor or simple flat pelves in accordance with the amount of transverse contraction they show in addition to the flattening which is present.

The irregularly contracted pelves cannot be grouped under any definite classification according to measurements, but each case must be treated according to the nature and degree of the contraction which is present in the individual patient.

TREATMENT. *Class A.* When the size of the pelvis and the estimated size of the child lead the attendant to believe that the case belongs to the class in which natural delivery at term is possible, the case should be left to nature until the usual indications for delivery arise. During the first stage great pains should be taken to avoid a premature rupture of the membranes. The patient should be kept in bed and cautioned to avoid all bearing-down efforts, and the condition of the uterus should be carefully watched, both by palpation and by observation of the ratio between the pains and intervals. If the pelvis is of the flattened form, in which version is the operation of election, it is wise to resort to operation at the first appearance of any alteration in the condition of the uterus, since the formation of a constriction or a retraction ring adds greatly to the dangers and difficulties of turning.

In well-marked justo-minor pelves, in which version is almost absolutely contraindicated, the labor may be allowed to go on until the condition of either mother or child leads the attendant to believe that spontaneous delivery is unlikely to occur. Forceps extraction is now the operation of choice in this class of pelves, but if this fails symphysiotomy is indicated, provided that the child is still alive; otherwise craniotomy should be performed. In pelves belonging to this class the probability is so great that delivery may be accomplished by the unaided efforts of nature, or, at any rate, by a forceps extraction of no more than moderate difficulty, that a primary resort to the Cæsarean section is unjustifiable unless the disproportion between the size of the fœtal head and the pelvic diameters is evidently such that there is little or no chance that the given child can be delivered alive through the given pelvis. It may sometimes

happen, therefore, that the opportunity for performing the operation of election in these cases may be lost, as no definite indications for its performance are present early in labor, and the mortality which attends the performance of the late Cæsarean section is so great, especially after vigorous attempts at delivery per vaginam, that it is never to be recommended. Symphysiotomy, however, in late cases offers a good chance of saving both patients, and the mortality of the late symphysiotomy is little greater than that of the early operation.

In patients who give a previous history of difficult instrumental deliveries of dead children, and who have borne large children, Cæsarean section at the time of election or early in labor is the best operation, even though the pelvic measurements seem large enough to allow the passage of an average-sized living child at term, unless the operator has reason to believe that the previous operations were unskilfully performed.

Craniotomy should never be performed on a living child when the mother's pelvis is large enough for reasonable hope that symphysiotomy will give room for the extraction of a living child, unless the mother's condition is bad and the craniotomy promises to be easy, as a forceps operation after a symphysiotomy is likely to be less prolonged and exhausting to the mother than a difficult extraction after craniotomy.

The fact that the final choice of operation in a given case comes between symphysiotomy and craniotomy shows that the relationship between the head and pelvis is such that although by measurement the pelvis belongs to Class A, practically it should be relegated to Class B in future labors.

Choice between Version and Forceps in Contracted Pelves. When the head is arrested at the brim of a contracted pelvis and a conservative operation is possible, the choice between version and forceps depends on the form of contraction present.

Justo-minor Pelves. The performance of version in justo-minor pelves, if the contraction is other than very slight, is never justifiable at full term except in the face of some pressing emergency, as placenta prævia, or in cases of transverse presentation. The general diminution of all the diameters makes the pelvic space so small that the release of the arms can rarely be accomplished in time to save the child. Moreover, the friction of the sinciput against the pelvic walls, due to the diminution of the transverse and oblique diameters, makes it extremely difficult to preserve flexion during the extraction of the after-coming head, and thus renders the rapid passage of the pelvis which is necessary to success in this operation unlikely, if not impossible. Forceps should, therefore, be preferred to version in these generally contracted cases, and if they fail, symphysiotomy or craniotomy should be performed in accordance with the other indications.

Simple Flat Pelves. In flat pelves, on the other hand, the mechanical conditions are such that if the transverse space is ample, the after-coming head adapts itself to the brim more easily, and can be extracted with much less force than is required for the delivery of the fore-coming head. In a simple flat pelvis both fore-coming and after-coming heads enter transversely in a somewhat extended position, and the bony resistance of the pelvis is exerted mainly upon the sides of the head. When in such a case the after-coming head is brought to the brim the narrow base of the skull passes the conjugate with ease. When the wider bitemporal and biparietal diameters have become engaged the head is compressed laterally, and becomes narrowed and elongated under the influence of the tractions. The ample transverse diameter of the pelvis offers no opposition to an increase in the occipitofrontal diameter of the head.

FIG. 193. FIG. 194.

FIG. 193.—Marked flexion of the head entering a generally contracted pelvis. (HIRST.)
FIG. 194.—Head passing through the inlet in a flat pelvis. (HIRST.)

A compensatory increase in two directions is thus provided for, the flattening in the third direction is easily accomplished, and the head passes. On the other hand, when the vertex of the fore-coming head meets the resistance of a flattened conjugate which is decidedly too small for it, the effect of the intra-uterine pressure or the force of the forceps on the base of the skull is necessarily to shorten the vertical diameter of the head. This decrease must be compensated for by a corresponding increase in both the other directions, not only in the unimportant occipitofrontal diameter, but also in the very diameters which are already too wide to pass the narrowed conjugate—the bitemporal and the biparietal.

This pressure from above on the base of the skull, whether exerted by the uterus or by the tips of the forceps blades, tends, therefore, to mould the head into a shape which is more unfit than its present

form to pass the brim of a flat pelvis, while traction from below is a direct agent in effecting the best configuration of the after-coming head to enable it to pass the brim.

These theoretical considerations have been confirmed by the practical experience of most obstetricians, and it may be laid down as a rule that the existence of more than very moderate flattening of the pelvis is an indication for version, if any operation is necessary, and a contraindication for forceps.

Rhachitic Pelves. As rhachitic pelves present every possible gradation from those in which the transverse shortening is hardly more than is common in the flat pelves to others which can hardly be distinguished during life from those of the justo-minor type, so too the mechanism of labor and the choice of operations vary with the proportions of the individual pelvis between these two extremes.

In doubtful cases the choice of operation is often doubtful, but since forceps, if unsuccessful, can be followed by version, while an unsuccessful version necessitates the loss of the child, it is usually good practice to give the forceps the preference in case of doubt.

TREATMENT. *Class B.* When the history and the results of physical examination assign the case to the class in which labor at term is likely to necessitate Cæsarean section or craniotomy, but at seven or eight months will probably result in the delivery of a living child, the treatment must be divided into the management of cases in which the diagnosis is made during pregnancy, those which are not diagnosed until the beginning of labor, and those in which the diagnosis is first made after prolonged labor or after the failure of one of the ordinary obstetrical operations.

Cases Seen During Pregnancy. When such cases come under the care of the obstetrician during pregnancy, the choice of treatment lies between the induction of premature labor at the time when it is estimated that the head has reached the largest size which will pass the pelvis and Cæsarean section.

The induction of labor is attended by such slight risks that, as there is a fair chance of preserving the lives of premature children under modern methods, this operation is preferred to abdominal delivery by many eminent authorities even at the present day. The estimation of the size of the fœtal head is so uncertain, however, that a difficult extraction, with its usually fatal results to the child, may result, even after the most careful calculations, and in any case the chances of survival of a premature child are doubtful, especially if the labor is at all prolonged or necessitates any operation. Cæsarean section, on the other hand, when performed at the time of election, offers practically a certainty that a living child will be delivered at full term at comparatively little risk to the mother.

There can be no question but what the interests of the child will be better served by Cæsarean section at term rather than by a

premature delivery, and, moreover, there is little difference in the prognosis for the mother in the two operations. In a question of this sort the circumstances should be carefully explained to the patient and her family, and the choice of operation made in accordance with their decision.

The propriety of always performing abdominal section when the choice of operation is restricted to these two alternatives is still *sub judice;* but there is a growing belief among the leading authorities, in this country at any rate, that under these circumstances Cæsarean section is the preferable operation.

If it has, however, been decided to induce labor in a given case, the size of the child should be carefully estimated by abdominal palpation, and the probable biparietal diameter calculated from the table given above. The pelvis should then be carefully measured both internally and externally, and the proportion between the results thus obtained carefully noted. The estimation of the size of the fœtal head should be repeated at short intervals until it is thought that the proper time for the induction of labor has arrived.

The point to be aimed at is to allow the pregnancy to go on until the child has reached the largest size at which it can be delivered by a moderately difficult normal labor or an easy operative delivery.

In case of a mistake in calculation, that is, if the labor is too easy, or the operation too difficult, the date of induction should be altered to correspond with this fact in case the same treatment is carried out in a subsequent pregnancy. It must be borne in mind, however, that the next child will probably be a little larger than the one which preceded it. When an operation becomes necessary, the choice between version and forceps must be decided upon the principles already laid down. The Cæsarean section in these cases may often be performed at the time of election rather than at the time of labor.

Cases Seen Early in Labor. When the pelvic deformity is only diagnosed at the beginning of labor the choice between an early performance of Cæsarean section and a resort to attempts at delivery by the natural passages, to be followed, if unsuccessful, by symphysiotomy, must depend first upon the obstetrician's certainty of the impossibility of delivering a living child per vias naturales, and lastly, but not less important, upon the decision of the mother and her relatives.

The choice between abdominal section and immediate symphysiotomy at this time should be settled in favor of the former operation without the slightest hesitation. If the pelvis is close to the upper limit of the class, and the relative disproportion of the head is not excessive, the choice should be given to the more conservative measures. If the adaptation is such that, in the judgment of the attendant and his consultants, delivery by version or forceps will

only be possible after symphysiotomy, if at all, the prognosis of the case should be fully stated to the family at the outset of labor, in order that the choice of operations should be settled early. This is important, because the results of Cæsarean section performed early in labor on cases which have not been subjected to previous attempts at delivery per vaginam are almost uniformly successful and in sharp contrast to the great mortality which occurs among late and secondary abdominal deliveries.

Cases Seen Late in Labor. If the deformity is not recognized until after the performance of unsuccessful attempts at extraction through the pelvis, or until uterine exhaustion has supervened, symphysiotomy followed by an operative extraction is the operation of choice if the child is still living, and unless the disproportion between the child's head and the pelvis is such as to indicate that the child cannot be extracted without danger of serious damage to the mother's pelvis from excessive separation of the pubic bones. If the child is dead or its vitality seriously compromised, craniotomy should be performed. If the child is living and the contraction of the pelvis is such that its extraction involves too great risk for the mother, even after symphysiotomy, craniotomy should be performed, even on the living child, rather than subject the mother to the extreme risks of a late Cæsarean section.

Abdominal delivery is justifiable in these cases only when the delivery of the child is impossible in no other way, and the Cæsarean section should be followed by an hysterectomy, the uterus not being in a fit condition to be closed and replaced in the abdomen.

TREATMENT OF CLASS C. *During Pregnancy.* When a woman whose pelvis is so highly contracted that the delivery of a living child at any time is impossible is seen during the early months of pregnancy, the choice of operation must rest between Cæsarean section and the immediate production of abortion. The question is one which must be decided by the family of the patient, but unless some contraindication to the Cæsarean exists in the patient's condition, there should be no question in the obstetrician's mind as to his proper course. Cæsarean section at term is by far the preferable procedure, but the physician's duty is to state the facts of the case to the patient and her friends, and to abide by their decision, or abandon the case.

In case the mother refuses to consider the Cæsarean section, and repeated abortions become necessary, the propriety of submitting her to a laparotomy for the sake of sterilizing her is a question which in the present state of abdominal surgery should certainly be raised.

Most physicians would probably consider that the chance of death to a healthy woman from a careful laparotomy is so slight that it is distinctly less than the risks to her health which are necessarily attendant upon frequently repeated abortions.

If abortion is decided upon, the physician in attendance should always protect himself against future calumnies by insisting upon a consultation.

At Term. After the child has reached a size sufficient to obstruct delivery, the performance of the Cæsarean section at the time of election is the only course which can be adopted.

INTRAPELVIC TUMORS.

The new-growths and other enlargements by which labor may be obstructed are fibroid tumors of the uterus, prolapsed ovarian tumors, large retro-uterine intestinal herniæ, cancer of the cervix, vesical calculi, and pelvic exostoses.

Fibroids. Fibromyomata of the uterus may be discovered for the first time during pregnancy, during labor, or during the puerperium, by either vaginal or abdominal examination. They appear as irregular nodular excrescences connected with the uterus, and are only liable to be confounded with tense multilocular ovarian cysts, which, when held in close proximity to the uterus and hardened by the effect of the increased intra-abdominal pressure of pregnancy, are often difficult or impossible of differentiation.

Fibroid tumors are often first recognizable during pregnancy, and if connected with the upper part of the posterior wall of the uterus are often not diagnosed until after delivery. More frequently, however, the growth of the latter is so rapid during pregnancy as to attract the notice of the patient or her attendant. If, in a given patient, the uterus is known to contain one or more fibroid tumors, the appearance of a sudden and rapidly increasing enlargement of them is strongly suggestive of pregnancy.

There are three varieties of fibroid, named from their relation to the uterine wall —the subserous, interstitial, and submucous varieties. Their importance varies during pregnancy, during labor, or during the puerperium, according to the variety which is present in a given case.

Subserous Fibroids. The subserous fibroids, if small, are of no importance in labor. Even if they are large, the only influence they exert is a tendency to the causation of premature labor by their encroachment on the already limited abdominal space.

Interstitial and Submucous Fibroids. The influence exerted by the interstitial and submucous fibroids varies with their situation.

In the Upper Segment of the Uterus. The fibroids which are located in the fundus and upper segment of the uterus complicate parturition only by their tendency to produce irregular and feeble contractions, and thus prolong labor, which may also be pathologically painful. After labor they increase the tendency to post-

partum hemorrhage, owing to the fact that the uterus retracts less readily, and also produce a tendency to delayed involution, and an increased risk of infection from sloughing of the tumor. The tendency to sloughing is due to the bruising which the tumor may receive during labor, and also to the alterations in its blood supply, which are caused by the rapid decrease of the uterine circulation during the puerperium. The sloughing may take place at any time during the first three or four weeks after delivery, and the patient can never be considered wholly out of danger until that time has elapsed.

In the Lower Segment. Upon the other hand, interstitial and submucous fibromyomata of the lower uterine segment often offer grave obstructions to the exit of the fœtus. If small, they are very likely to cause malpresentations and malpositions; if large, they not infrequently fill up the pelvis to such an extent as to become incarcerated in the excavation, and may then, though only exceptionally, render delivery by the natural passages impossible.

TREATMENT. *Fibroids of the Upper Segment.* Fibroids which are located above the pelvic brim may so far lessen the contractility of the uterus as to render forceps or version necessary for delivery. Otherwise they require no treatment, but they should lead to increased precautions against the occurrence of post-partum hemorrhage, and the puerperium should be watched very carefully, as in case of their sloughing an early hysterectomy may be necessary to preserve the patient's life.

The decreased blood supply of the tumor, which is due to the involution of the uterus and to its puerperal retraction, sometimes leads to a strangulation of the tumor, which is signalized by a tolerably definite set of symptoms.

A woman a few days delivered is suddenly seized by intense paroxysmal pains referred to the uterus and accompanied by periodic exacerbations not unlike labor pains. The attack is accompanied by pyrexia and the appearance of intense localized tenderness at some point about the uterus. In the presence of such symptoms the possibility of the existence of a small fibroid in the uterus must be remembered, even where no such lesion has been previously recognized. In the majority of instances the trouble can be averted by the prompt administration of ether, to surgical anæsthesia, at the beginning of each attack of pain. The relaxation of the uterine muscles so secured decreases the pressure on the veins, and so permits the escape of serum from the partially strangulated tumor.

In the majority of instances such care will tide over the attacks and avert the strangulation. In case of its failure the tumor must surely slough, and its prompt removal by operation is to be advocated.

Incarcerated Fibroids. *Knee-chest Position, etc.* When incarcerated fibroids are discovered during pregnancy they should be at

once lifted above the superior strait by gentle taxis, the patient being placed in the knee-chest position. The attempt should be repeated after a few days if it proves unsuccessful at the first trial. Ether should be used if necessary. If the attempts at raising the fibroids are successful, it is unlikely that the fibroids will re-enter the pelvis if they are of any considerable size; but to guard against this occurrence the examination should be repeated at short intervals, and the tumors raised from the pelvis if necessary until their increased size makes re-entrance impossible.

Interstitial fibroids which involve the lower uterine segment only are frequently entirely within the pelvis, and in that case are often unnoticed until the advent of labor makes a vaginal examination necessary. The same attempt at raising them from the pelvis by vaginal or rectal taxis, with the patient in the knee-chest position, should then be resorted to. If reasonably prolonged efforts of this kind fail to relieve them, tight packing of the vagina in the knee-chest position may be tried. With this exception and an occasional repetition of the taxis during labor the case should be left to nature unless exhaustion appears. These tumors are largely muscular in their structure and are subject to the same processes of softening and retraction with which we are familiar in the cervix, and by this process tumors which seem to oppose a hopeless obstacle to labor are usually entirely effaced and withdrawn above the head in a most surprising manner during the progress of labor. Indeed, it may be laid down as a rule, that no intrapelvic fibroid tumor is capable of offering so hopeless an obstacle to delivery as to be a sufficient cause for an early Cæsarean section. Even, although the tumor wholly fills the pelvis, the chances of ultimate delivery by natural labor through the natural passages after its retraction are so great that it is better to adopt a conservative policy in the hope of this result, and to resort to craniotomy, forceps, version, or hysterectomy only in case of its failure and the appearance of exhaustion.

Choice of Operation. The choice between these operations must depend on the amount of space gained by retraction before the appearance of exhaustion. The patient should be left to the care of nature until her condition warrants a belief that she is unlikely to be able to terminate the delivery herself. A final effort should then be made to raise the tumor by taxis. If this fails and the pelvic space is sufficient to permit delivery by forceps or version, one of these operations should be done. If there is not room enough for the delivery of an intact child, craniotomy may be possible. When exhaustion appears before any considerable amount of retraction has been effected, Cæsarean section, followed by hysterectomy, should be done. This should not be delayed until complete exhaustion has appeared; but when but little retraction of the tumor has been accomplished and the steady rise in the maternal pulse

shows the mother's strength is failing, and that she is unlikely to endure a continuance of labor until adequate retraction is accomplished, the operation should be performed. When sufficient retraction has been accomplished to permit the choice to be made between hysterectomy and craniotomy, the latter should be preferred, unless it promises to be difficult and dangerous.

When abnormal presentations or positions are produced by the presence of small fibroids, the operation appropriate to the presen-

FIG. 195.

A polypus occupying the pelvic cavity in labor. (RAMSBOTHAM.)

tation should be undertaken as soon as the retraction of the tumor affords sufficient space for its performance.

Polypi. If a uterine polypi is discovered during labor, it may, if pedunculated and easily accessible, be removed by the use of the scissors or écraseur. If it is non-pedunculated, attached by a broad base, and of a size sufficient to obstruct labor, it may, if readily accessible, be removed piecemeal by the use of scissors or of Thomas' serrated spoon, after its capsule has been incised, to an extent sufficient to allow the child to pass. This operation is diffi-

cult and dangerous, and should only be attempted when the tumor is very accessible.

When a uterine polypus is discovered for the first time after labor, it should be removed by the écraseur, and its pedicle, if necessary, erased by the sharp curette. Non-pedunculated fibroids should be left untouched after labor, but should be carefully watched in order to anticipate the appearance of sloughing, at the first sign of which the necrosed tumor should be thoroughly removed by the finger or by the large blunt curette recommended for the removal of adherent secundines.

FIG. 196.

An enlarged ovary blocking up the pelvic cavity in labor. (RAMSBOTHAM.)

Ovarian Tumors. Ovarian tumors of small or medium size may occasionally become prolapsed into Douglas' fossa below the pregnant uterus, and when so placed constitute an extremely dangerous complication of labor.

It is commonly thought that they are to be differentiated from fibroids in a similar situation by fluctuation, when that can be obtained; by the mobility they sometimes show; and by the absence of any attempts at retraction during labor. Experience has shown,

however, that an ovarian tumor behind the uterus, if under pressure, is not to be differentiated by the touch from a fibroid.

TREATMENT. The attempt may be made to raise the tumor out of the pelvis by the most gentle taxis. The application of any force is dangerous, as a thin-walled cyst may be easily ruptured. If taxis fails or if the descent of the head produces a dangerous amount of pressure against the tumor, immediate laparotomy should be performed and the tumor removed.

Cæsarean section may or may not be performed at the same time in accordance with the other indications present.

It was formerly advised that the tumor should be aspirated per vaginam if it obstructed labor, but results have proved this to be a far more fatal and dangerous procedure than Cæsarean section and oöphorectomy.

Carcinoma Uteri. The treatment of cancer of the cervix occurring during pregnancy has been fully considered on page 117, and it is only necessary here to sum up briefly the indications for treatment.

When cancer of the cervix is discovered early in pregnancy and it seems probable that the disease can be entirely removed, an immediate hysterectomy[1] should be performed in the interests of the mother, without reference to the child, as this offers the only chance of saving the mother's life, and the chances of prolonging the pregnancy to term, even at the expense of the mother, are comparatively slight.

When the cancer is discovered shortly before the child reaches viable age or after this period, the treatment depends upon whether any reasonable hope exists of complete removal of the disease. If it seems possible that the pregnancy can be prolonged to seven months without compromising the mother's chances seriously, this should be done under careful observation, and as soon as the child is judged to have reached the period of viability, Cæsarean section should be performed and followed by a complete hysterectomy.

If, on the other hand, it seems certain that the mother's life cannot be saved, even at the expense of the child, the pregnancy should be allowed to go to term. If the infiltration of the surrounding tissues with the new-growth is sufficiently limited to allow of its being done, an amputation of the diseased tissues should be performed just before the expected date of labor, either by the curette, scissors, or by the galvanocautery.

When the disease is too far advanced to render this course possible, the case should be allowed to go to term, and the child delivered by Cæsarean section, as in this case the hopeless condition of the mother renders the life of the child the more valuable of the two.

[1] Most operators would prefer to induce abortion at least a week before performing the hysterectomy.

Vesical Calculus. A vesical calculus complicating labor is a very rare condition. A stone in the bladder, when impacted between the head and pubic wall, is sometimes mistaken for an exostosis of the symphysis.

The diagnosis between the two is to be made by the passage of the urethral sound and by the fact that exostoses are necessarily immovable, while calculi, though fixed during the continuance of the uterine contractions, are movable during the intervals.

FIG. 197.

Cystocele complicating labor. (RAMSBOTHAM.)

If a diagnosis of vesical calculus is made, the fœtal head should be raised above the superior strait and an attempt made to push the calculus above the brim, by pressure on it with the fingers, through the vesicovaginal septum. If this is unsuccessful the stone should be removed from the bladder by an incision through the septum, which should be carefully closed after labor, when it will usually heal by first intention. If this fails it can be repaired by a subsequent operation.

Litholapaxy is sometimes possible, but is rendered so difficult by the lack of space around the stone as to be inadvisable at this time.

Exostoses. Multiple exostoses of the pelvic bones sometimes occur, but are very infrequent. They usually spring from the sacrum, but sometimes from the symphysis as well. The treatment to be adopted depends upon the size and shape of the pelvic canal. This condition differs from the other bony contractions of the pelvis only in the fact that if the exostoses are irregular in shape and sharply pointed, the danger of producing fatal lacerations of the soft tissues during a pelvic delivery may make a resort to an abdominal operation an imperative necessity.

FIG. 198.

Bony tumor of sacrum. (PLAYFAIR.)

ATRESIA.

Atresia Vaginæ. Atresia of the vagina may be complete or incomplete, congenital or acquired. Complete atresia is of no obstetrical importance, since it renders pregnancy impossible.

Congenital atresia is the result of imperfect development of the external organs of generation. Acquired atresia is due to cicatricial contraction, either after sloughing of the vaginal walls from prolonged pressure in previous labors, or as a result of deep ulcerations due to diphtheria, typhoid fever, syphilis, or other exhausting general diseases. Whatever the cause, the condition should be left untreated during pregnancy and until the advent of labor, when the presenting part should be allowed to dilate the constriction under the influence of the uterine contractions until exhaustion of the uterus or of either patient is impending. When this occurs the constriction should be divided by multiple, preferably lateral, superficial incisions, and the forceps applied.

During convalescence a large-sized glass—Ferguson—speculum should be kept constantly in the vagina unless its presence prove too irritating, the orifice being kept plugged with iodoform gauze to minimize the danger of septic infection.

Atresia Uteri. In very rare instances the septum of a bipartite uterus may form an obstacle to the advance of the head. If in such cases a small hole is made in the septum by a blunt instrument, it is sure to dilate rapidly under the pressure of the membranes or presenting part.

Cicatricial stenosis of the cervix may very exceptionally require the same treatment which was recommended for cicatrices of the vagina.

CHAPTER XXII.

HEMORRHAGE BEFORE AND AFTER DELIVERY.

PLACENTA PRÆVIA.

By placenta prævia is meant the insertion of the placenta on the lower uterine segment—*i. e.*, on that portion of the uterus which is subject to distention during labor. This condition differs from the normal status not only anatomically but also in its results, because, as will be explained, the dilatation of the os and the advance of the presenting part imply in these cases a certain amount of premature separation of the placenta from its attachments, with more or less disastrous results.

A normally situated placenta is only loosened from its attachments by the extreme retraction of the uterus which follows the birth of the child, but a placenta prævia is detached to a certain extent by every contraction of the uterus which is powerful enough to dilate the lower uterine segment. This gradual detachment of the placenta takes place in all the varieties of placenta prævia, occurring to a greater extent and at an earlier stage of cervical dilatation the more complete the prævia. This is due to the fact that the placenta, composed as it is of non-elastic tissue, is unable to accommodate itself to the changes in shape which the distensible cervix undergoes under the influence of the uterine contractions, and is necessarily torn from its attachments to a greater or less extent with every advance which is made in the dilatation of the cervix. In normal cases the placenta is only detached thus at the end of labor, at a time when the mouths of the uterine sinuses are closed by the retraction of the uterine muscle. A placenta prævia, on the other hand, is detached at a time when the uterine vessels are being held widely open by the passive distention of the tissues around them. The natural result is that in cases of placenta prævia the first stage of labor is complicated by the recurrence of hemorrhages with each contraction of the uterus, each more or less severe in accordance with the amount of separation of the placenta effected by the given pain. These hemorrhages may reach alarming proportions, and can only be controlled effectively by emptying the uterus.

Classification and Natural History.

Placenta prævia is ordinarily classified under three heads: placenta prævia centralis, where the insertion is such that the fully

dilated os is completely covered by the placenta; placenta prævia partialis, where the placenta covers only a portion of the fully dilated os; and placenta prævia marginalis, where only the edge of the placenta is felt when the os is fully dilated. Closely allied to placenta prævia, both anatomically and clinically, is the condition known as a low insertion of the placenta, in which the placenta is not inserted into the zone of the uterus which is to undergo dilata-

FIG. 199.

Complete placenta prævia; os partly open. (From RAMSBOTHAM.)

tion, but does extend into the area immediately continuous with it. This portion of the uterine wall may or may not be subjected to sufficient alteration during labor to cause the detachment of the placenta, and has been well called the dangerous zone, in recognition of the fact that, although a low insertion of the placenta does not necessarily imply the unavoidable hemorrhages of a true placenta prævia, it does involve a considerable risk of hemorrhage, which does, indeed, occur in a large proportion of the cases.

In placenta prævia the insertion of the cord is so low in the uterus that a complication of the placenta prævia by a presentation or prolapse of the cord is extremely common.

The cause of placenta prævia is as yet unknown. The fact that it occurs almost always in multiparæ and most commonly when pregnancy follows closely a previous miscarriage or labor, suggests that subinvolution of the uterus may play some part in the etiology. As in other conditions where there is narrowing at the pelvic brim, there is an increased liability to breech and transverse presentations.

A large percentage, indeed a majority, of the cases of placenta prævia result in an interruption of pregnancy between the fourth and ninth months. The likelihood of premature delivery is greater in proportion to the completeness of the prævia, and increases with the advancement of pregnancy. It is characteristic of the hemorrhages of placenta prævia during pregnancy that they appear suddenly and without assignable cause. The bleeding is usually slight at first, and increases with each repetition of the hemorrhage, but no dependence can be placed upon this rule, since the first or second hemorrhage may sometimes be so severe as to reduce the patient to a state of extreme collapse, or may even be fatal.

After delivery the situation of the placental site in the less actively muscular lower zone of the uterus, and in immediate proximity to the vagina, results in a greatly increased danger of both post-partum hemorrhage and septic infection, and more than usually strict precautions must be observed to prevent these accidents.

Prognosis. The prognosis of placenta prævia is serious both for mother and child in all cases, but the amount of danger varies greatly in different cases, and is always closely proportional to the completeness of the prævia. The successful termination of a case of central insertion is a feat of which any obstetrician may well be proud, while, on the other hand, a marginal insertion involves so much less risk that the lives of both patients should be almost invariably saved by adroit and careful management, and are often preserved by the efforts of nature alone.

Diagnosis. The occurrence of hemorrhage without assignable cause at any time after the third month of pregnancy—*i. e.*, after the formation of the placenta, should give rise to a suspicion of placenta prævia.

In marginal or partial cases the examining finger may detect a greater thickness and softer consistency of the lower uterine segment on one side as compared with the other. The existence of many large pulsating vessels in the uterine wall, as felt per vaginam, is a suspicious sign. The only conclusive point, however, is the recognition of the placental surface by the fingers introduced through the os.

The probability that sudden, unexplained hemorrhages during the last three months of pregnancy are to be explained by the existence of a prævia is so great, and the dangers of the condition are so serious that the gentle insertion of the finger through the os, in order to determine whether the placenta presents or not, is usually justifiable when the hemorrhage has been profuse and this abnormality is suspected, and is to be advised, if the os is patulous.

Treatment During Pregnancy. During the second three months of pregnancy it should be the invariable rule to empty the uterus as soon as the diagnosis of placenta prævia is established. This is done primarily in the interests of the mother, but it must be borne in mind that, if a serious hemorrhage has occurred at so early a period as this, the chances of saving the child by prolonging the pregnancy to the period of viability are so extremely small as to be unworthy of consideration in comparison with the risks involved for the mother.

In the sixth month, and especially in the latter part, the question of whether or not it is wise to attempt to prolong pregnancy until the child is viable is one which must be decided in each individual case. The factors which enter into the decision are: first, the supposed completeness or incompleteness of the prævia, and, second, the circumstances of the patient. If the insertion is marginal, or, at most, but partial, and if the patient's financial position makes it possible for her to remain persistently in bed, to have skilled and careful watching, and abundant means for summoning instant help on the occurrence of hemorrhage, a conservative policy may be permissible. If, upon the other hand, the prævia is wholly or almost complete, if the patient is obliged to attend to her household duties, and lives at a distance from the physician's office, the risk to the mother from the continuance of the pregnancy is so extremely great that it should not be incurred on the problematical chance of obtaining a living child.

After the seventh month the dangers incurred by the child in premature delivery are but little, if at all, greater than the risks of death from asphyxia which are involved in the continuance of intra-uterine life after such a separation of the placenta as is implied by any but the most moderate hemorrhages. The chances of the child being thus so nearly even, no matter what course is followed, the interests of the mother are sufficient to indicate an immediate termination of the pregnancy, unless the mother's circumstances are such that she can be kept constantly under the charge of a physician who is ready to operate at once if the emergency arises. If the mother is collapsed from previous bleeding, and if the hemorrhage at the moment is slight, it is, however, usually best to adopt a conservative policy, in order to delay the shock of delivery until she has been prepared for it by rest and stimulation.

In collapsed patients the extraction should always be slow, since such a delivery produces much less shock than a rapid extraction, which may not infrequently prove fatal to the mother under such circumstances.

TREATMENT IN LABOR. When the diagnosis of placenta prævia has been established the first step in treatment under all circumstances should be an effort to insert the finger to its full length within the os, when it should be made to detach the placenta from the whole of that portion of the lower uterine segment which it can reach.

FIG. 200.

Partial placenta prævia. The os partly dilated; the membranes entire. (RAMSBOTHAM.)

This separation permits retraction of the uterine wall to occur, and so closes the mouths of the vessels over the whole of the separated surface. It is invariably followed by at least a temporary cessation of the hemorrhage. When the absence of dilatation makes even the insertion of the finger impossible, or after this preliminary separation of the placenta has been effected, three methods of further treatment present themselves for selection. These three methods are: (1) the use of an intra-uterine bougie, of manual dilatation of the os, or rupture of the membranes, to hasten labor, followed by a tamponade to control the hemorrhage, after which the remainder of the case is left to nature; (2) manual dilatation of the os to a

degree sufficient to admit two fingers, and a bipolar podalic version by the method of Braxton Hicks, to be succeeded by gentle traction on the leg in order to draw the half breech into close contact with the lower uterine segment, and thus arrest hemorrhage by direct pressure; (3) manual dilatation of the os to full dilatation, internal podalic version, and immediate extraction.

The choice between these methods must depend primarily upon the form of prævia present in the individual case, and secondarily upon the amount of hemorrhage and the rigidity of the cervix.

MARGINAL INSERTIONS. When the insertion is marginal or lateral, the hemorrhage after detachment is usually slight, and the mere engagement of the head commonly compresses the lower portion of the placenta against the pelvic brim with sufficient force to prevent further bleeding.

In this form of prævia, hemorrhage not infrequently fails to make its appearance until good labor is present and the os is considerably dilated, and in such cases mere rupture of the membranes, with the consequent descent of the head, is often sufficient to arrest it. Even if the hemorrhage occurs at the beginning of labor, digital detachment of the placenta, in combination with the acceleration of labor by the methods just enumerated, may be all that is required.

If a slight hemorrhage persists after detachment it may sometimes in marginal cases be temporarily checked by the tampon, which also exercises a decided influence in hastening the advent of labor. It should always be remembered, however, that when hemorrhage continues after the insertion of the tampon it has merely been converted from frank external bleeding into the far more dangerous internal concealed form. It should, therefore, be an invariable rule that the physician who takes upon himself the responsibility of the use of the tampon in placenta prævia should never permit himself to leave his patient's bedside during the time the tampon is in place, since he alone is competent to detect the onset of a concealed hemorrhage. The signs of hemorrhage behind the tampon are, of course, those of the classical concealed hemorrhage, and will be described under that heading. When the tampon is used for that purpose the patient should be placed in the left latero-prone position, a Sims speculum should be introduced, and the whole vagina thoroughly cleansed and then distended from the fornix to the introitus by packing within it the largest number of aseptic pledgets of cotton which can be introduced under the use of such pressure as is judged to be advisable. The tampon should be held in place by a vulvar pad or a T-bandage, and should never be left in position over four hours. At the end of that time it should be removed and the size of the os determined by vaginal examination. As soon as dilatation is sufficiently advanced to afford a probability that engagement of the head will follow rupture

of the membranes, they should be torn. Should hemorrhage occur behind the tampon, or if it is profuse from the start, it is generally best to abandon the conservative policy, and perform version at once.

The method of performing version should depend upon the amount of dilatation already present. If the os is well dilated or dilatable, internal podalic version with immediate extraction, or forceps, offers the best chance for both mother and child. If the os is still small, bipolar version and a subsequent control of the hemorrhage by continuous gentle traction on the legs, while some-

FIG. 201.

Partial placenta prævia. The same case after rupture of the membranes; the head pressing on the placenta prevents further loss of blood. (RAMSBOTHAM.)

what more dangerous for the child, is distinctly safer for the mother, as it involves less shock and less loss of blood than the performance of a manual dilatation.

LOW INSERTION OF THE PLACENTA. Insertion of the placenta into the dangerous zone is to be treated upon the principles which apply to marginal placenta prævia, but in these cases the liability to serious hemorrhage is much less even than in cases of marginal attachment, and radical treatment is less often necessary.

PARTIAL INSERTIONS. These cases vary in degree from marginal to central insertions, and their treatment must be that of the variety they approximate.

CENTRAL INSERTIONS. In central implantation of the placenta, the hemorrhage is usually profuse from an early period of labor. If the os is soft, the best method of treatment is manual dilatation of the os, after a preliminary separation of the placenta, and version. For the sake of the child the dilatation should be carried to the fullest degree possible, and the internal podalic method should be used and followed by immediate extraction, since any efficient preliminary separation is, in these cases, likely to diminish the area of functional placental surface so greatly as to render the death of the child by asphyxia almost certain. When, however, the process of dilatation is attended by such extreme hemorrhage as to seriously threaten the life of the mother, the interests of the child become secondary. Two fingers should then be forced through the substance of the placenta, and the child turned by the bipolar method, when traction on the leg will usually control the hemorrhage at once. Under these circumstances, however, the extraction should be made as rapid as is consistent with the integrity of the maternal tissues, since a slow extraction necessarily involves a fœtal death.

When in central implantation the cervix is so rigid that its dilatation promises to occupy a long time, and would offer an insuperable obstacle to immediate delivery in the event of the occurrence of fresh hemorrhage during the operation, the treatment depends upon the amount of blood which has been lost and the severity of the hemorrhage which is going on. When the mother is in good condition and the hemorrhage at the moment is slight, the placenta should be separated as far as possible with the finger, and the vagina tamponed, in the hope that the cervix may become sufficiently softened to permit of rapid dilatation before serious hemorrhage occurs. This plan offers so much the lowest maternal death rate as to be justifiable in central placenta prævia, although by it the interests of the child are, of course, subordinated to those of the mother, and a large proportion of stillborn children must be expected when it is adopted.

Although as a general rule the cervix in placenta prævia, and especially in complete cases, is soft and yielding, it sometimes happens that it is rigid and difficult to dilate. When in central implantations profuse flooding occurs in the presence of an os so rigid that it will not admit the finger to perform a preliminary separation, there is only one generally accepted method of procedure, and that is a forcible dilatation of the os, with or without incision of its edges, to a degree sufficient to permit the performance of bipolar version.

Within recent years the question of the propriety of delivering the patient by a Cæsarean section in all cases of central implantation of the placenta has been raised by some writers. This question is still *sub judice*, and can only be definitely settled by future expe-

rience. There can be little doubt, however, but that if the cervix is exceptionally rigid and the hemorrhage profuse, if the patient is still in good condition, and if the child is nearly at term, a rapidly performed Cæsarean section, followed by a hysterectomy, offers the best chance for both patients. These cases are, however, extremely rare, and in the vast majority of cases the mother's interests are best served by the performance of a rapid manual dilatation and version, after which the uterus should be firmly packed with gauze. This complication of childbirth is always so full of danger to the mother that the interests of the child, especially if premature, should always be considered as distinctly secondary.

FIG. 202.

Tamponing the puerperal uterus for bleeding. (DÜHRSSEN.)

Ether. In placenta prævia, as in other forms of ante-partum hemorrhage, the use of ether is not contraindicated by previous loss of blood to any degree short of collapse and unconsciousness. Its effect on the pulse and general condition is invariably favorable, provided that it is given carefully and in moderate quantity.

After-care. After delivery the uterus should be carefully watched, not only to guard against immediate post-partum loss of blood, but also because the liability to secondary hemorrhage is also increased in placenta prævia, and it is a wise precaution to pack the uterus firmly with sterile gauze in all cases. If the patient is appreciably collapsed from loss of blood, the usual treatment for this condition should be at once and persistently applied.

Concealed Accidental Hemorrhage.

The detachment of a normally situated placenta in such a way that the resulting hemorrhage is retained within the uterus is known

by the name of concealed accidental hemorrhage. This is the most dangerous form of obstetrical bleeding, both because it is often overlooked or misunderstood by the attendant, and because the pressure of the blood effused behind the placenta tends constantly to increase the detachment, which in its turn still further increases the hemorrhage, and so forms a vicious circle that usually results in the loss of an enormous and frequently of a fatal amount of blood.

ETIOLOGY. Concealed accidental hemorrhage may arise: (*a*) from a central separation of the placenta, and confinement of the effused blood between the placenta and uterine wall, the edges of the placenta remaining firmly attached; (*b*) from separation of the upper edge of the placenta, and confinement of the blood between the membranes and fundus; (*c*) from separation of either edge of the placenta, accompanied by rupture of the neighboring membranes and discharge of blood into the amniotic cavity; (*d*) from separation of the placenta, when the presenting part plugs the lower uterine segment so thoroughly as to prevent any external escape of blood. In the last two cases the internal hemorrhage may be accompanied by a slight external leakage of blood or serum, though not in a quantity sufficient to account for the symptoms.

These separations are usually due to irregular or partial contractions of the uterus, to blows which fall directly against the site of the placenta, or to other external violence, but they may occur without any assignable cause.

FIG. 203.

Frozen section of the uterus of a woman who died of accidental hemorrhage at the Maternité de Beaujon. (PINARD and VARNIER.)

PROGNOSIS. Goodell's famous collection of 106 reported cases gave a death rate of 51 per cent. for the mothers and 94 per cent. for the children. Most of these cases occurred, however, at a period when but little was known of this affection, and it is probable that the extremely high death rate was largely due to non-recognition of the condition, a failure which has been much less likely to occur since the publication of his article, to which most of our knowledge on the subject is due.

DIAGNOSIS. The diagnosis is ordinarily easy, and failure to make it must usually be due to the fact that the rarity of the condition makes it unlikely to occur to the minds of practitioners not especially interested in obstetrics. Its recognition must rest on a sudden appearance of the ordinary symptoms of collapse from hemorrhage —*i. e.*, pallor; shortness of breath; a demand for more air; or a request to be fanned; uneasy, restless, or tossing movements in the bed, technically known as jactitation; a sense of dizziness; feebleness of vision, or even darkness of the whole room to the patient's sight; and a progressive feebleness and rapidity of the pulse.

When these symptoms occur suddenly and increase rapidly without being accounted for by visible hemorrhage, they should at once arouse a suspicion of the existence of the concealed form, and the special symptoms of the condition should be searched for.

The uterine contractions become steadily weaker, and the intermittent pains are succeeded by a tonic rigidity accompanied by a sense of distention which is not infrequently evidenced by the constantly repeated remark, "I shall burst." The abdomen in the meantime increases in girth from the rapid distention of the uterus by the effused blood. The fœtal heart becomes weak, distant, and irregular. In cases of central separation, an auxiliary tumor, due to an accumulation of blood behind the placenta, is sometimes to be felt on one side of the uterus. In the intra-membranous variety liquor amnii tinged with blood may be seen to leak away. When the hemorrhage is confined only by the pressure of the presenting part there may be some slight external hemorrhage.

The onset of the attack is sudden and the progress is rapid. The clinical picture is striking, and, when once seen, is thereafter unmistakable. Though mild cases of this accident may occasionally occur, the loss of blood is ordinarily so great that the whole duration of the attack is brief, and if mother or child is to be saved, the appropriate treatment must be adopted without the loss of a minute.

TREATMENT. The intra-uterine tension is always great, but is in itself insufficient to restrain the hemorrhage, since fresh blood is poured forth during each interval of relaxation, while the periods of arrest of hemorrhage by the active contractions of the uterus become progressively shorter and shorter as the muscular fibres become over-tired and paralyzed by their rapid distention. In this, as in all forms of uterine hemorrhage, the one hope of closing the open mouths of the vessels lies in an immediate emptying of the uterus, in order to afford an opportunity for complete contraction and retraction to occur. If, as is uncommon, the head is in the excavation at the time the hemorrhage occurs, the application of forceps and the most rapid extraction possible is the proper operation. In the majority of cases, however, the separation either takes place during pregnancy, and before the onset of labor, or else while

the head is still free above the brim and the os but slightly dilated. In this case manual dilatation and version is ordinarily the preferable operation.

The dilatation should be as rapid as possible, as it is justifiable in such an extremely grave emergency to take greater risks of laceration than would ordinarily be permissible. As soon as full dilatation has been reached the membranes should be ruptured, a foot seized, and version and extraction performed with the utmost speed consistent with the safety of the maternal tissues.

The substitution of high forceps for version, on the ground of preventing still greater hemorrhage, by maintaining a but little diminished uterine tension until the moment of delivery, has been advocated by some operators, but is objected to by others, and seems irrational, from the fact that retraction, which alone can arrest the hemorrhage, cannot occur until the uterus is emptied, and that in untreated cases the bleeding continues as long as the woman lives in spite of the enormous pressure.

If, in the introduction of the hand for version, the effused blood is set free, the quantity which escapes from the vulva and the force with which it is expelled may be extremely disconcerting, but it must be remembered that this blood has been already lost from the circulation, and that the uterine retraction which will surely follow its evacuation will more than compensate for the accompanying loss of uterine tension. During the extraction of the child, light friction should be constantly applied to the fundus of the uterus, and every precaution taken against the occurrence of additional or post-partum hemorrhage.

Post-partum Hemorrhage.

Some slight loss of blood is so frequently observed during the third stage of labor and immediately afterward that it may be considered a practically normal occurrence. Post-partum hemorrhage can only be defined as an exaggeration of this normal phenomenon to an excessive degree, that is, to an extent which results in markedly increased frequency, and decreased force of the patient's pulse.

In practice the condition of the average patient is seldom much affected by a loss of less than ten or twelve ounces, so that it may be stated that a loss of less than eight ounces may be considered as a trifling matter. True post-partum hemorrhage consists in the loss of blood from the utero-placental site, but it is convenient to describe in addition under this head the bleeding from torn vessels in the soft parts, which occasionally occurs immediately after delivery. The treatment of these two forms of hemorrhage is radically different, and the differential diagnosis between them must be made by observation of the condition of the uterus and of the character of the effused blood.

Hemorrhage which is due to laceration is seldom profuse, and is composed almost wholly of red arterial blood. True post-partum hemorrhage may be either profuse or gradual, and is composed of mixed arterial and venous blood, the latter predominating and giving to the mixture a much darker or more purple color. Finally, and most important, true post-partum hemorrhage can only occur when the uterus is relaxed and flabby, and ceases during active contractions of the organ, but these have little or no effect upon loss of blood from ruptured arteries of the cervix and vagina. If, then, hemorrhage occurs in the presence of a wholly retracted and firm uterus—*i. e.*, a uterus which is felt by external palpation as a small, firm, spherical body behind the symphysis pubis, or if the occurrence of a contraction fails to arrest the loss of blood, the vagina and cervix should be subjected to a careful ocular inspection in order to discover or exclude the presence of spurting arteries in the lacerated portions of either.

Hemorrhage from Laceration. DIAGNOSIS. The examination should be made with the best light attainable and through a large bivalve speculum, if such an instrument is at hand. If, as may often happen at the moment of an emergency, no regular speculum is obtainable, the patient should be placed in the lithotomy position, and the vagina exposed by the use of four retractors bent to an acute angle and held by assistants. Two of the retractors should retract the lateral walls, and two are applied to the anterior and posterior walls, respectively. If no better material offers, these may be improvised by bending the handles of four of the largest spoons that can be obtained to the appropriate angle. This contrivance, with a little ingenuity, can be made to give a surprisingly good view of the whole vagina and cervix.

Abundant as is the blood supply of the recently parturient vagina, its vessels are individually so small that hemorrhage sufficient to cause alarm rarely follows even the most extensive lacerations of this portion of the genital canal. Sufficiently deep cervical tears may, however, cause a laceration of the circular artery of the cervix, a vessel which is in most cases large enough to be the cause of distinctly serious hemorrhage.

TREATMENT. The only appropriate treatment of loss of blood from either form of tear is the immediate repair of the laceration by appropriately placed sutures. These will be inserted most easily by a fully curved needle held at right angles to the shank of a proper needle-holder, two instruments which should be a portion of every obstetrician's outfit. If the physician has neglected to provide himself with them, or is timid about undertaking the repair of a deeply lacerated cervix in the presence of hemorrhage, with perhaps an insufficient light and almost useless assistants, the bleeding may be readily controlled by the passage of any form of needle

backward and forward through the edge of the tear in such a way that the spurting artery is entirely included within the suture after its ends have been tied. In most cases the cervix can be seized with the fingers and drawn sufficiently near to the vulva to permit the insertion of such a suture without the aid of a needleholder.

True Post-partum Hemorrhage. This much more common phenomenon is due to failure of the normal mechanism for its prevention, and a thorough comprehension of this process is so essential to the rational treatment of all forms of true uterine hemorrhage that its discussion is a necessary preliminary to any clear and intelligent description of the treatment which should be employed.

The separation of the placenta from its uterine attachments necessarily leaves the mouths of the uterine vessels in a patent condition, a fact which would always provoke profuse hemorrhage, if this were not prevented under normal circumstances by the fact that the uterine contractions which follow the detachment of the placenta drive it into the vagina, when its expulsion leaves the uterus free to retract upon itself. In this process the vessels are closed by collapse of their thin walls under the pressure of the muscular fibres which surround them during the shrinking of the placental site, which is consequent upon retraction. If, however, retraction fails, or, after it has once occurred, is lost from any cause, the uterine vessels remain open and, with their orifices no longer occluded by placental tissues, are in a condition eminently well suited for the occurrence of hemorrhage. It follows necessarily, as a corollary to this explanation, that the natural and legitimate method of arresting post-partum hemorrhage is by securing prompt contraction and retraction of the empty uterus.

TREATMENT. *Prophylaxis.* In the discussion of post-partum hemorrhage it is impossible to lay too much emphasis on the importance of the rôle which prophylaxis plays in this connection. It may be safely said that in careful and experienced hands, post-partum hemorrhage is an almost unknown occurrence, and that if placenta prævia, deep and prolonged surgical anæsthesia, previous extreme distention of the uterus, and severe collapse from antecedent causes be excluded, post-partum hemorrhage can in most cases be traced to some neglect of precaution by the professional attendants.

It is the habitual custom of careful men to place by the bedside in every case of labor, as the period of delivery approaches, all the articles which are necessary for the treatment of hemorrhage if it should occur. These are: a quantity of pieces of ice about the size of a hen's egg; brandy, ether, ergot, and a hypodermic syringe; a pitcher of hot water and a Davidson or fountain syringe. To this should be added sterile gauze for packing the uterus, if this should become necessary. From the moment the head distends the peri-

neum the hand of an assistant should be placed upon the fundus uteri, and should employ gentle friction upon it from that time until after the delivery of the placenta and until the empty uterus has been contracted firmly and without marked relaxation for at least ten minutes.

The physician should, moreover, avoid a too rapid extraction of the child in the absence of any indications for hurry. Indeed, the

FIG. 204.

Incorrect method of grasping uterus to cause contraction. Ulnar border of hand may compress right ovary. (DAVIS.)

short time which is used after the delivery of the head in feeling for the cord about the neck, wiping the eyes, and clearing the fauces of the child is distinctly advantageous, as it affords the uterus a chance for the retraction which is rendered necessary by the descent of the head.

After delivery, under normal circumstances, the child should be given into the care of a bystander, while the hand of the physician

or of a trained assistant keeps a careful watch of the fundus of the uterus through the abdominal wall, in order to observe the first sign of relaxation. When relaxation is noted, it should be at once combated by the performance of gentle but rapid circular friction of the uterus with the tips of the fingers, which should pass quickly across its anterior surface, and by infolding the abdominal wall around the fundus.

If this motion is not followed by immediate hardening of the uterine body, a piece of ice should be applied to the abdomen, and rubbed briskly about over the uterus. If any suspicion of distention of the bladder is aroused, either by the history or by abdominal palpation, the catheter should be passed at once, since a distended bladder may of itself prevent an adequate retraction of the uterus.

FIG. 205.

Correct and efficient method of grasping uterus to prevent bleeding. (DAVIS.)

The efficiency of ergot in producing a tonic contraction of the recently delivered uterus is undoubted, and since its use is productive of no possible harm, it is the usual custom, and the authors believe should be the habit of all obstetricians, to administer to the patient a drachm of the fluid extract as soon as the placenta is delivered. This is to be recommended as a routine precaution, because the action of ergot is too slow to render it of value if its administration is delayed until after the occurrence of hemorrhage. In case of hurry it is useless unless given hypodermically, and this is a procedure which it is wise to avoid, in view of the fact that the hypodermic use of ergot is not infrequently followed by subcutaneous abscesses. If ordinary ergot is so used, it should always be injected deeply into the muscles of the thigh, as this method

decidedly diminishes the risk of subsequent suppuration. The risks attending the use of the so-called aseptic preparations of ergot is probably somewhat less. The use of ergot by the mouth is occasionally followed by nausea; but this is rare if no more than a drachm of the fluid extract is given, and given in about two ounces of cool water.

All these precautions should be redoubled whenever there is any special reason to fear the occurrence of hemorrhage.

Arrest of Hemorrhage. If from neglect of prophylaxis or other cause, post-partum hemorrhage occurs, the chief end of treatment is to secure retraction, an end which is attainable by many different means, most of which depend for their success on the production of uterine contractions by irritation. The various means which may be tried are: emptying the uterus, massage, ice, hot water, astringent solutions, gauze packing, and electricity.

Emptying the Uterus. The first essential in every case is the complete emptying of the uterus. If hemorrhage occurs before the expulsion of the placenta, it should be immediately extracted, if possible, by the use of Crédé's method of expression; but, if this is not promptly successful, by the introduction of the hand into the uterus. If the after-birth has been already removed and an examination of the membranes shows them to be entire, the uterus may still have become distended by clotted blood, which may usually be expressed after the manner of Crédé, but if not it must be removed manually.

Massage of the Uterus. The uterus being empty there are many methods of securing and maintaining retraction, but the one first to be described possesses the advantage of efficiency in almost every case, and of requiring no apparatus other than the hands of the operator.

It is known under the name of bimanual massage of the uterus, and is performed by the insertion of one hand into the vagina, and its passage in the extended position, with the palmar surface upward, into the posterior fornix of the vagina, while the other hand is applied to the fundus externally, and crowds the uterus down into the pelvis in order to permit the internal fingers to have the freest possible access to its posterior wall. The uterus is then briskly but not roughly rubbed between the two hands, which maintain throughout the process gentle pressure toward each other. This manœuvre tends to control hemorrhage in two ways: first, by the direct pressure of the hands which hold the walls of the uterus together over at least a portion of the organ; and, secondly, and of more importance, by a stimulation of the uterine muscle, due partly to direct irritation of the muscular fibres, but in all probability more directly produced by a mechanical irritation of the large sympathetic ganglia which are found along the posterior walls of the parturient uterus.

When the uterus has become contracted this condition may usually be maintained by holding a piece of ice against the abdominal wall in the region over the fundus. In very slight hemorrhages this expedient alone is often all the treatment that is required.

Intra-uterine Applications. If massage is not promptly successful, it is usually best to pass rapidly to some other manœuvre, since, while some cases are favorably affected by this method of treatment, others yield more readily to different plans. Without withdrawing the internal hand from the vagina it may again be passed rapidly into the uterus, and used not only to empty the cavity of any clots which may have accumulated within it, but to promote contraction by the presence within the organ of a moving foreign body. If even this is not efficient, a piece of ice may be placed within the cavity, when the muscular fibres usually show their resentment at its presence by a contraction which expels it from the os.

This intra-uterine use of ice is contrary to the principles of asepsis, but it is better to run the risk of infection than to lose the patient from hemorrhage. This use of ice should not be too prolonged, on account of its evil effect in lowering the temperature and increasing the shock which is already present as a consequence of the hemorrhage. For this reason, if the ice is not promptly expelled it should be withdrawn by the hand and followed by a hot intra-uterine douche of boiled water, or 1 to 5000 corrosive sublimate, at a temperature of about 110° F. to 115° F.—*i. e.*, at that which is distinctly but not uncomfortably hot to the hand. The injection of hot water is not only valuable from its ordinary effect in causing contraction of the vessels, but more especially from the stimulation of the muscle which results from the sudden change from the temperature of ice to that of the injected fluid. During the intervals which necessarily occur in the substitution of ice for hot water, and *vice versa*, bimanual friction should be carefully kept up.

Gauze Packing. These measures, if promptly carried out, seldom fail. If they do fail, or if the hemorrhage is so serious at the start that no time is to be wasted over minor methods, the main resource at our disposal is the very effective expedient of packing the uterus with sterile gauze. This controls hemorrhage, first, by its effect as a foreign body in promoting contraction of the uterus; and, second, by its direct pressure against the open uterine vessels when it is compressed by uterine action. The gauze used may or may not be impregnated with iodoform, but should at all events have been carefully sterilized. Its sterility should be maintained during its introduction by a careful preliminary cleansing of the vagina and the surrounding skin, and by having the part of the gauze which is outside the vulva suspended in the air by an assistant to protect it from contact with unclean surfaces.

Immediately after labor it is generally best introduced by the hand of the operator. In the process of packing one hand should be passed entirely into the vagina, and the gauze pushed to the fundus by two or more fingers introduced through the cervix, while the external hand depresses the fundus until it is within their reach. The physician should not introduce enough gauze to dilate the uterus, but merely enough to excite contraction by the irritation produced by a foreign body, the amount needed being usually but little larger than the closed fist. The remainder of the gauze, which should be cut or folded into a strip about two inches wide, should then be packed into the vagina, so as to distend it thoroughly. After the introduction of the gauze the fundus of the uterus should be watched by the hand until it has remained firmly contracted and retracted for at least an hour. The gauze, which should be all in one piece, should be removed by traction at the end of from twelve to twenty-four hours, and the uterus should then be washed out with an antiseptic solution. Should secondary hemorrhage occur at this time, the uterus may, of course, be packed again.

Styptics. The physician should always carry sterilized gauze in his bag, but if for any reason neither gauze nor any other aseptic material can be secured, he may turn to the use of an intra-uterine injection of an astringent solution, of which a 1 to 100 watery solution of acetic acid is decidedly the best. If this is not at hand a mixture of the ordinary corrosive sublimate solution with enough vinegar to give the fluid a distinctly brownish tinge is a good substitute.

If this method fails and hemorrhage continues until the patient is in imminent risk of an immediate and severe collapse, the uterus should be again cleared of clots, and a ball of absorbent cotton or piece of clean cloth, saturated with tincture of iodine, preferably Churchill's, or with Monsel's solution diluted with four times its quantity of water, should be passed into the uterine cavity. The advantage of iodine over the iron solution is that it is more stimulating in character and is less liable to cause an extensive thrombosis of the vessels with its increased danger of septic infection. It must be borne in mind that the use of styptics is only allowable in the absence of the better means of controlling hemorrhage.

Faradism. If a faradic battery be at hand, its use, either by placing both electrodes on the abdominal wall, or by the passage of one within the uterus while the other is applied to the abdomen, may produce efficient contractions. As an addition to these measures time may often be gained by compression of the aorta against the lumbar vertebræ by deep external pressure with the hand through the abdominal wall, bearing in mind the situation of the vessels to the left of the spinal column.

The subcutaneous administration of ether or brandy, though contraindicated during the continuance of most forms of hemorrhage, is to be earnestly recommended in post-partum or other uterine bleeding, since the increased loss of blood which undoubtedly follows upon their use is far more than counter-balanced by their effect in promoting contraction of the uterus by stimulation of its muscular tissues.

After the cessation of hemorrhage the uterus should be watched by the hand for at least an hour, or until it has been firmly contracted without intermission for at least thirty minutes, both because the weakened state of the system renders a second relaxation by no means improbable, and because a loss of blood which, under ordinary circumstances would be unimportant, may at this time be a matter of the utmost gravity. As soon as it is judged expedient to dispense with manual control of the fundus, a firm and carefully adjusted binder should be at once applied. If the thickness of the abdominal wall is so great as to prevent satisfactory pressure of the binder upon the uterus, this may be obtained by inserting under the binder a number of folded towels which should be so adjusted as to completely surround the uterus. A rubber bag partly filled with water, so that it readily adjusts itself to the conformation of the subjacent tissues, is even more effective, or in the absence of this appliance, its place may be supplied by a bag loosely filled with moistened meal or sand.

Treatment of Collapse from Hemorrhage. If the hemorrhage has been at all serious, the patient is left in a condition of collapse, that is, of cerebral anæmia, which may require constant and close care for many hours or days. In order to encourage the intracranial circulation the foot of the bed should be raised by blocks, and in extreme cases the patient's legs should be held in position above the bed by means of pillows. She should be warmly covered, and the body heat should be carefully maintained by a free supply of artificial warmth, which is most conveniently furnished by filling bottles with hot water and placing them under the bedclothes in close proximity to the patient. Care must be taken that the bottles are tightly corked and that they are sufficiently wrapped in blankets to prevent burning of the skin.

Free circulation of fresh air throughout the room should be carefully provided for, as the need for oxygen is urgent. Brandy should be given freely, at first by hypodermic injection, repeated three or four times in order to secure the administration of perhaps two drachms, and later by the mouth or rectum. If the patient has not been anæsthetized, a half drachm of ether under the skin often acts excellently, but this should not be repeated more than once.

Strychnine and digitalis, with morphine for restlessness, are also stimulants of great value in the treatment of collapse. Nitro-

glycerin and cocaine hypodermically are also of more or less temporary value in lifting the patient over a period of depression. In extreme cases an intravenous injection of fifteen to thirty minims of the officinal solution of ammonia, diluted with an equal quantity of water, often causes a prompt reaction.

Saline Infusion. The most important means at our command for restoring a patient who is in a state of collapse from hemorrhage is infusion with normal saline solution (0.6 per cent.). The solution is prepared by dissolving a drachm and a half of common salt and fifteen grains of bicarbonate of soda in a quart of boiling water. This should then be filtered and cooled down to 110° F. to 120° F., at which temperature it should be introduced into the body.

The infusion may be given subcutaneously if the heart action of the patient is strong enough to warrant the belief that it will be absorbed, or intravenously if the condition of the patient is such that absorption from under the skin will probably amount to little or nothing. In subcutaneous infusion the submammary connective tissue spaces offer the most favorable location for the introduction of the salt solution. The instruments necessary are a medium-sized aspirating-needle and a funnel, which are connected by a rubber tube four or five feet long. The overlying skin should be thoroughly sterilized and the needle introduced into the connective-tissue space between the breast and the ribs, the funnel and tube being already attached and filled with the solution, so that air will not be forced into the tissues when the infusion is started. By raising the funnel more or less above the head the solution will flow into the loose submammary tissue under the influence of the hydrostatic pressure. As much should be introduced under the first breast as is considered desirable, and the process should be repeated on the other side. As a general rule, about a quart of salt solution can be introduced under each breast, if the solution is allowed to run in slowly, without causing marked discomfort, and it will all be absorbed in from twenty to thirty minutes. If the patient's condition is such that intravenous infusion is decided on, a superficial vein, usually the median cephalic, is exposed, or if the patient is so extremely anæmic that the veins cannot easily be found, the radial artery should be laid bare. The vein or artery should be nicked and the point of a fine canula passed within it toward the heart if the vein, and away from it if the artery, is chosen. To the canula should be attached a rubber tube and funnel, and the latter being held at an elevation of two or three feet above the vein, the desired amount of saline solution can be slowly poured into the system, a careful watch being kept on the pulse in the meantime. The object of the infusion is to provide a sufficient amount of fluid to enable the heart to work to advantage until the tissues can replace the blood which has been lost.

This method of treatment can well be supplemented or, in mild cases, replaced by the use of large rectal enemata of saline solutions to which brandy, black coffee, or other stimulants may be added.

Patients in a state of collapse from hemorrhage may be said to be trying to lift a heavy load, and the object of the stimulation is to carry that load for them until they can bear it for themselves. Therefore, it must be remembered in all cases that stimulation must be constant, and not spasmodic, and that it is not enough in many cases to help the patient by a single application of stimulants, but that stimulation must be thoroughly kept up until the condition of the pulse shows that the desired result has been accomplished, when they should be gradually reduced, to be increased again if the patient's condition indicates it.

AFTER-CARE. The after-treatment of these cases should consist of absolute rest, deprivation of society, and the frequent administration of small quantities of food and stimulants, the best preparation being usually eggnog in the following proportions: Two eggs should be broken into a cup, well mixed, but not beaten up, and strained through a coarse colander. To this should be added from one-half to one ounce of brandy and enough milk to fill the tumbler. It should then be given to the patient in small quantities of not more than one-half ounce at a time every few minutes.

In the winter, if fresh oysters can be obtained, their administration to the patient raw may be an agreeable and efficient alternative for this diet. No limit can be placed to the quantity of nutriment which may properly be given to a patient convalescing from a severe hemorrhage, the rule being that the largest amount that the patient can be induced to swallow is the most beneficial.

Iron, in the form of the tincture of the chloride or some other reliable preparation, should be given in large doses throughout the convalescence.

CHAPTER XXIII.

ECLAMPSIA.

ECLAMPSIA is the name given to that complication of the child-bearing state which is characterized by the appearance of convulsions arising independently of pre-existing organic disease. This definition is intended to exclude convulsions due to epilepsy, cerebral lesions, hysteria, etc., which may occur during pregnancy or at the time of delivery.

The eclamptic condition may arise at any period of the term of gestation—*i. e.*, during pregnancy, at the time of labor, or during the first few days of the puerperium—but it is never seen except as a complication of the pregnant state.

ETIOLOGY. The etiology of eclampsia has always been a subject of the deepest interest, but the causative agent has not as yet been definitely determined. There is no doubt at the present time but that eclampsia is the direct result of a severe general toxæmia, which the most recent investigations tend to show to be due to an intra-uterine infection. This infection theory has not yet, however, been proved beyond the possibility of a reasonable doubt, and the view that the toxæmia is the result of deficient excretion of the products of maternal and fœtal metabolism, whether those normally produced during pregnancy, or abnormal products which may be formed under certain conditions, has many adherents. Whatever the true cause may be, one fact has been made clear of late years—*i. e.*, that eclampsia is the result of a general toxæmia, and is not due entirely to renal insufficiency as was formerly supposed.

PATHOLOGY. The pathology of eclampsia has not as yet been thoroughly worked out. The principal lesions which are found post-mortem are: in the liver, multiple areas of coagulation necrosis into which hemorrhage has taken place; in the kidneys, a condition varying from slight cloudy swelling to a severe glomerulo-nephritis; congestion of the brain cortex, with anæmia of the rest of the brain; and a general anæmia of the other organs, with occasionally small hemorrhagic areas in them.

The most characteristic lesions are the changes which have taken place in the liver. On macroscopical examination a large portion of the surface of the liver may be found dotted with small punctate hemorrhages, which are found on microscopical examination to consist of minute areas of coagulation necrosis into which hemorrhage

has taken place. This condition of the liver is so marked and so universal in eclampsia that it is considered by some high authorities to be absolutely pathognomonic.

The pathological changes which the kidneys present are less severe in type and more variable in character than are those which are found in the liver, and, moreover, they are evidently more recent in origin. They vary from a slight degree of cloudy swelling in some cases to a marked acute glomerulo-nephritis in others, so that they can hardly be considered in any sense characteristic of the disease.

The other organs show no diagnostic lesions, being more or less anæmic and possibly presenting a mild degree of inflammation, but the general distribution of the pathological changes shows that we have to deal with a general toxic process. Small hemorrhages may be found in all the organs, but they are apparently due to the violent circulatory changes which take place during the convulsions, and are not characteristic of the condition.

Prodromal Symptoms. As is the case with the other toxæmias, the onset of eclampsia is preceded, in the majority of cases, by a train of prodromal symptoms. These symptoms usually give warning of the impending danger days, or it may be only hours, before the eclamptic seizure develops, and it is possible in many cases for the attendant, who should be put on his guard by this warning, to prevent the attack by appropriate treatment. There are some cases, however, in which the onset of the toxæmia is so intense that the prodromal symptoms do not appear and the appearance of a convulsion is the first sign of danger.

The prodromata of eclampsia are: headache, often accompanied by dimness of vision; œdema, more or less general in distribution; sudden, sharp, epigastric pain; a return of the nausea and vomiting of pregnancy; changes in the mental condition; and alterations in the character of the urine. These symptoms may all be present in any case, or, as has already been said, none of them may appear.

Headache. Perhaps the most common of the premonitory symptoms of eclampsia is the appearance of a dull headache, usually referred to the frontal region. The pain is usually slight in degree, and is often described as an uncomfortable feeling just behind the eyes. Its significance is decidedly increased if it is accompanied by dimness or indistinctness of vision, which may occasionally amount to almost total blindness. These symptoms are so suggestive that, even if unaccompanied by anything else, they should cause the greatest anxiety, and should lead to an immediate and thorough examination of the urine.

Œdema. Another very common symptom, and one which is of considerable prognostic importance, is the development of more or less general œdema. Œdema of the feet and ankles is so common

in pregnancy as to be of no importance, but the development of a general œdema, which is most easily to be detected in the hands and eyelids, is highly suggestive of impending danger, especially if associated with other symptoms. The cases in which marked general œdema occurs are usually less severe than those in which there is little or no œdema.

Vomiting. A return of the nausea and vomiting of early pregnancy is another symptom which is to be noted in certain cases. This, while not diagnostic, is very significant, and should lead to a careful search for the other symptoms of eclampsia. It commonly occurs also when the fœtus has died in utero, so that it is not sufficient for the purpose of diagnosis unless it is accompanied by other symptoms.

Epigastric Pain. A less common but a most important symptom is the sudden appearance of severe epigastric pain. This is perhaps the most urgent of all the prodromata, for it is usually followed by the development of convulsions within a few hours, and, therefore, should be met with the most radical treatment.

Mental Changes. Not infrequently the onset of the convulsions is preceded by alterations in the mental state of the patient. These may vary from a slightly confused, torpid mental condition up to a sudden access of irritability almost amounting to mania in some cases.

The Urine. The changes which appear in the urine are, as a rule, more significant than any of the other symptoms, for the urine is the best indicator we have of the damage which the absorbed toxines have caused in the system. It has long been known that a large percentage of pregnant women develop a slight albuminuria, and observation has shown that these women are somewhat more liable to eclampsia than those whose urine is perfectly normal. The presence of albumin is, however, only a somewhat uncertain indication of the true condition of the kidneys, and cases of eclampsia are on record in which the urinary examination showed throughout a complete absence of albumin.

The characteristics of the urine in eclampsia are in general those of an acute nephritis of greater or less severity, as is to be expected from the pathological changes which are found in the kidneys. The urine is usually much diminished in quantity, of a smoky color, and of a high specific gravity. The absolute amount of total solids excreted, especially of the urea, is markedly diminished. Albumin is present in the great majority of cases, varying in amount from a slight trace to one-half per cent. or more. The sediment usually contains many casts and a large amount of blood. A sudden decrease in the amount of urine, attended by the appearance of albumin, blood, and casts, suggests most strongly impending eclampsia.

Description of the Attack. The ordinary eclamptic convulsion is of the same type as the well-recognized epileptiform attacks. It is ushered in by a few seconds of complete loss of consciousness, which is succeeded by a spasmodic contraction of the smaller muscles of the face, giving rise to that peculiarly unpleasant smile, the risus sardonicus of early medical literature. The eyelids open and shut in rapid alternation, and the eyeballs roll up until the pupils are barely visible. The head is drawn rapidly from side to side. The thumbs are strongly flexed across the palms, and the hands are clenched and pass rapidly from pronation to supination, and *vice versa*. In severe attacks the forearms are rapidly flexed and extended across the chest. Toward the end of the convulsion these clonic movements are succeeded by a general tonic muscular rigidity with opisthotonus; respiration is suspended, the eyeballs protrude from the sockets, and the conjunctivæ are deeply injected; the face is cyanotic, and the jaws are clenched, sometimes inflicting serious wounds upon the partially protruding tongue. A marked increase in the pulse rate, together with a rise of temperature, which is usually temporary, accompanies each convulsion.

The seizures vary in length and severity in different cases, lasting from a few seconds to one or two minutes, and they are usually succeeded by a period of coma of varying depth and duration, from which the patient wakes with no recollection of the attack. The prognosis of the given case varies somewhat with the number and severity of the convulsions and the depth of the ensuing coma. Under ordinary circumstances, unless prompt and efficient treatment is instituted, the convulsion is repeated after a longer or shorter time, the intervals between the successive attacks becoming progressively shorter and the attacks more severe, while life lasts.

Each succeeding convulsion increases the gravity of the prognosis for both mother and child. The convulsions are, of course, only symptoms of a general process, but each one weakens the patient's heart to a certain extent, as well as increases the danger of cerebral or other internal hemorrhage, on account of the great strain to which the vessels are subjected. Each convulsion also increases the risk to the child of asphyxiation from the interference with the placental circulation which necessarily accompanies the violent muscular spasm in which the uterine muscle is involved as well as the voluntary muscles.

Diagnosis. Although the appearance of convulsions during the period of gestation presupposes eclampsia in the great majority of cases, a differential diagnosis must be made between eclampsia on the one hand, and hysteria, epilepsy, or some cerebral lesion on the other.

Hysteria is to be excluded by the epileptiform character of the convulsion, the period of coma which follows it, and the examination of the urine.

Epilepsy is to be ruled out by a consideration of the previous history of the patient, by the prodromal symptoms, if present, and by an examination of the urine, which should for this reason be immediately drawn by catheter. If the convulsion is epileptic, examination of the urine may show a trace of albumin and a few hyaline casts, but the urine will be light in color and of a low specific gravity. In eclampsia, on the other hand, the urine is usually scanty, concentrated, loaded with albumin, and contains blood and an abundance of granular or brown granular casts in the sediment. In very rare cases of eclampsia the urine may show little or no change from the normal, and it must always be remembered that in any case, unless the patient has emptied her bladder recently, a large part of the specimen obtained by the catheter may have been secreted sometime before the onset of the attack, and the urine may not show the changes in a characteristic degree until a later specimen is obtained.

Cerebral lesions are to be differentiated from eclampsia by the previous history, the general examination of the patient and the examination of the urine.

PROGNOSIS. Eclampsia is one of the most fatal of obstetrical accidents, and it is perhaps the only complication of obstetrical origin which cannot be combated by the application of surgical principles. It occurs according to various observers once in every 250 to 500 cases, and its mortality varies according to different statistics from 20 per cent. to 40 per cent. in all cases. The estimated prognosis in a given case is a very difficult problem, but several factors enter in to make the individual prognosis better or worse—*i. e.*, primiparity or multiparity; the occurrence of the disease during pregnancy, labor, or the puerperium; the presence or absence of the prodromata; the severity and number of the convulsive seizures; the degree of urinary suppression; the promptness and general course of treatment adopted.

Eclampsia occurs much more frequently among primiparæ than multiparæ, but according to our experience the prognosis is distinctly worse among the latter class of patients.

The period of gestation at which the disease manifests itself seems to have a distinct bearing on the prognosis of the individual case. The cases which develop during pregnancy show a distinctly greater mortality than those which occur at the time of labor, while the cases of the latter class have a somewhat worse prognosis than those which develop after delivery has been accomplished. This difference in the prognosis is to be explained in all probability by the hypothesis that a more virulent toxæmia, and therefore a more fatal one, is necessary to produce eclampsia in a patient in approximately normal condition than in a patient whose resistance has been lowered by the strain of labor, and, furthermore, that nature's cure, the

emptying of the uterus, is accomplished with less shock to the patient in those cases in which labor is already in progress.

The presence or absence of the prodromal symptoms must always receive careful consideration in estimating the individual prognosis. A careful study of the cases which have occurred in our experience leads us to the very definite conclusion that in those cases which show the premonitory symptoms in a marked degree, especially general œdema, the disease usually runs a milder course than in those in whom the prodromata are absent or only present to a slight degree. This is probably due either to the fact that the patients in whom no premonitory symptoms are present are peculiarly susceptible to the action of the toxines which produce eclampsia, or else to the fact that the toxines are absorbed in such an amount that the system is overwhelmed by them.

The prognosis is, of course, also modified by the number and severity of the convulsions which occur and by the depth of the coma which follows them. As a general rule, it may be said that the more severe and numerous the convulsions the shorter the intervals between them, and the deeper the ensuing coma, the more serious the prognosis. It must be noted, however, that a patient may occasionally die in the first convulsion, or may survive many severe attacks.

As a rule, too, the gravity of the situation in the individual case is fairly closely indicated by the degree of suppression of the urine, which is, of course, a fair indication of the inflammatory changes which have taken place in the kidneys.

The prognosis also varies considerably with the form of treatment, the promptness of its inception, and the thoroughness with which it is carried out. In late or untreated cases the mortality is tremendous.

TREATMENT. The treatment of eclampsia is best considered under prophylaxis, the care of the attacks, and after-care.

Prophylaxis. Prophylactic treatment should be promptly instituted whenever any of the premonitory symptoms appear, as it is in the prevention of eclampsia that the best results of treatment are apparent. The aim of the prophylactic treatment is to accomplish the following results: first, the quieting of the nervous system, so that the liability to convulsions may be reduced to a minimum in the presence of the toxines which have already been absorbed, by securing for the patient complete rest and quiet; second, the removal of all avoidable strain from the excretory organs, by restricting the diet; and, finally, and most important, the free elimination of the toxines in the system by diuresis, catharsis, and diaphoresis.

The urine should be closely watched and frequently examined, since its character is the best guide to be followed in determining the activity of the treatment to be adopted.

The use of any other diuretic than large quantities of water is of doubtful value, although the acetate and tartrate of potash are sometimes useful. The vicarious elimination of the urea or other toxic substances by such catharsis and sweating as the strength of the patient permits is of the first importance.

A saline cathartic should be administered in frequently repeated small doses until a moderate diarrhœa has been produced. The choice between Hunyadi water, citrate of magnesia, Seidlitz powders, and Epsom salts, depends principally upon the taste of the patient.

The use of pilocarpine to produce sweating was formerly recommended by high authorities, but its undoubted value is more than counterbalanced by the danger of œdema of the lungs which is inherent to its use. If used at all in the treatment of eclampsia, it will do less harm as a prophylactic than after the patient is weakened by the occurrence of convulsions. It is, however, rarely, if ever, necessary in prophylaxis, as it can be replaced by the milder and more continuous sweating, produced by the use of hot water bottles or an excessive amount of bedclothes.

In extremely threatening cases the hot pack or steam bath may be resorted to, or the patient may be placed for twenty minutes in a tub filled with the hottest water that can be borne. After any of these expedients to start sweating the patient should be placed in a bed thoroughly warmed with heaters, and covered by a thick layer of blankets.

If the premonitory symptoms appear during labor they always furnish a sufficient indication for terminating labor at the earliest possible moment without undue shock to the patient, and if the head has passed the pelvic brim, manual dilatation and extraction with forceps is strongly to be advised. If immediate delivery is thought to entail too much shock, the patient should be etherized to the point where partial unconsciousness is produced without interference with the uterine contractions, and this condition should be maintained until the delivery can be safely accomplished.

Treatment of the Attack. Owing to the high death-rate which has occurred in eclampsia under all the forms of treatment which have attained any wide-spread popularity, innovations in treatment are almost constantly under consideration, and it is impossible to determine accurately the merits of each modification until it has been given a fair trial. It will, therefore, be our policy in this section to discuss carefully the treatment of eclampsia under the most generally accepted system, and then to consider briefly the other methods which are under trial or more or less in use at the present time.

Ante-partum Eclampsia. When convulsions follow the premonitory symptoms in spite of the prophylactic measures employed, the

expectant policy of treatment should be abandoned and a more active course instituted.

When convulsions occur during or before the sixth month of pregnancy, some eminent authorities recommend a conservative policy—*i. e.*, the use of chloral or other sedatives, combined with diaphoresis by the hot bath or hot pack, and free catharsis, in the hope of checking the convulsions by producing free elimination of the toxines in the system, and of prolonging pregnancy until the child is viable, or even at term. Although this plan has occasionally proved successful, the general opinion is that the risk to the mother, which is involved in temporizing with such a serious condition, entirely outweighs the comparatively slight chance of prolonging the existence of a premature child, whose hold on life has already been weakened, if not destroyed, by the convulsions which have occurred.

The mother's chances are ordinarily thought to be best, if immediate delivery is resorted to, in imitation of the course of nature, which, in a large proportion of cases, terminates the affair by the spontaneous occurrence of labor, and thus removes the cause of the disease. Carl Braun declares that he has never known but one case of eclampsia between the fourth and sixth months of pregnancy to recover, except where abortion had taken place. Therefore, since the induction of labor furnishes a considerable number of recoveries, immediate delivery has been generally adopted as the best plan to be recommended in well-marked cases.

Inter-partum Eclampsia. When eclampsia has developed during labor the patient should never be left for a moment until delivery has been accomplished. Ether should be administered constantly to the point of producing unconsciousness without stopping the uterine contractions, and at the first sign of a second convulsion should be pushed to full anæsthesia. If a convulsion occurs, the tongue should be guarded from laceration by the insertion of a folded handkerchief between the jaws after the fashion of a bit. The patient must be watched constantly until delivery is completed, and operative delivery should be instituted as soon as due preparation can be made.

It may seem heroic treatment to recommend immediate delivery when only a single convulsion has occurred and the patient is in fairly good condition, but experience has shown that this treatment gives the mother her best chance, and that comparatively little improvement can be expected in the majority of cases until the primary cause of the trouble—*i. e.*, the ovum—is removed. In about 50 per cent. of the cases the convulsions cease when the uterus is emptied, a fact which shows the efficacy of this procedure. Of course the removal of the ovum does not necessarily put an end to the trouble immediately, as the amount of toxines already in the

mother's system may be sufficient to produce fresh convulsive attacks, but it lessens the probability of a fresh supply of the poison being absorbed, and to that extent simplifies the problem to be met by further treatment.

The number of convulsions being distinctly lessened by immediate delivery, the result is that a greater proportion both of mothers and babies is saved by this method of treatment than by any other which has met with any wide-spread recognition, for each succeeding convulsion not only makes the prognosis worse for the mother, but also impairs the child's vitality.

When the patient has been allowed to endure convulsion after convulsion, and is completely comatose, the shock of a forced delivery may be almost immediately fatal, and every precaution must be taken to minimize it. Since, however, she must surely die unless the condition is relieved, the best chance for the mother even then lies in immediate and gentle delivery under full anæsthesia, though even this offers but little hope.

The method of delivery to be chosen is of no small importance. The slow methods, which initiate or increase the uterine contractions by irritation of the uterus, should never be employed, as they are liable in themselves to produce fresh convulsions by the irritation they cause. The procedure which should almost uniformly be adopted is manual dilatation of the os under full anæsthesia, followed by the performance of forceps or version in accordance with the general indications for these operations. The dilatation of the os should, however, be slower and more gentle than under ordinary circumstances, since the element of hurry which may enter into this operation when performed for other conditions—*e. g.*, hemorrhage, is absent in eclampsia, and the minimizing of local irritation is an object of prime importance.

After delivery the use of ergot should be avoided, both because it is supposed to have a directly unfavorable action in eclampsia and because the loss of a certain amount of blood is beneficial, if the patient is in good condition, rather than otherwise, as it removes a certain amount of the toxines from the system. After recovery from ether the patient should be watched continuously, at least by a nurse—*i. e.*, should never be left alone for a moment until three or four days have elapsed without a recurrence of the convulsions, and the physician should arrange to be within call as much as possible during this interval.

The absorption of the toxines being stopped by the emptying of the uterus the next step in treatment is identical with the treatment of post-partum eclampsia, and is directed toward securing as complete and rapid an elimination of the toxines already in the system as possible, and at the same time to quieting the irritable nervous mechanism as thoroughly as possible. This can best be done by

the production of free catharsis, diuresis, and diaphoresis, and by the free use of such sedatives as chloral and the bromides in large doses. The sedative treatment should be continued for some days after the convulsions have ceased, unless the patient is stolid and quiet.

It must not be forgotten that the whole treatment of eclampsia as thus outlined is depressant in its action, and that the general condition of the patient must be carefully watched, and free stimulation administered whenever the heart shows any signs of weakening, whether from the shock of the operative delivery, of the convulsions, or of the treatment.

The urine should be drawn by catheter every six hours, unless it is passed naturally at shorter intervals. The total quantity should be carefully recorded, and each specimen examined for albumin and casts, since the prognosis which must be given in the individual case depends largely on the action of the kidneys in excreting the toxines, as well as on the frequency with which the convulsions recur.

If the patient can swallow, a mild diuretic, such as cream of tartar water or acetate of potash, should be freely and continuously given. Free catharsis should be established by the use of a saline cathartic, preferably given in repeated small doses if the patient is able to swallow, or if not, one-sixteenth of a grain of powdered elaterium may be placed on the tongue, and repeated at two-hour intervals until the desired result is obtained. If these fail, croton oil in one or two-drop doses may prove efficient.

The production of free sweating is usually considered to be one of the most important factors in the success of this method of treatment, and it is an undoubted fact that patients who sweat freely are much more apt to recover than those who do not, but whether the sweating is curative in its action, or whether those cases in whom it is impossible or difficult to produce sweating are more profoundly toxic than the others, it is impossible to determine. Pilocarpine is of undoubted value at this time, but its use is attended with so much risk of œdema of the lungs that it is dangerous and not to be advised in this disease where a decided tendency to general œdema already exists.

Sweating may be produced by the use of the hot pack, or of hot air or steam baths, the apparatus for which may be extemporized in any household with the aid of an elbow of stove-pipe. The bedclothes should be raised above the patient by a cradle made of barrel hoops, if nothing better offers, or by hanging them across a rope, stretched above the bed from top to bottom in imitation of the ridge-pole of a tent. They should then be tucked very closely around the edges of the bed and under the patient's neck and shoulders. The stove-pipe should be passed into the tent which

they make at a point where it cannot burn the patient's body, and, if a hot-air bath is desired, a large kerosene or alcohol lamp placed under the dependent end. If a small gas stove is at hand the same purpose may be served by placing it directly in the bed.

If a steam bath is preferred, a kettle, or, better, a copper still (borrowed from the nearest apothecary) of boiling water may be mounted on a large lamp or an oil stove, and connected with the pipe by thick layers of wet cloth. The steam bath is rather the more efficient, but is somewhat more difficult to extemporize.

The patient must be carefully watched while she is in the hot-air bath, special attention being paid to the pulse, for the prolonged use of this treatment, especially if the patient does not sweat freely, has a markedly depressant action on the heart, which must be met by discontinuance of the bath and by free stimulation.

As soon as fairly profuse sweating has been produced the apparatus may be removed and the patient covered thickly with warm blankets and surrounded by heaters to keep up the process of sweating. When the skin begins to dry off the bath may be repeated unless it has had a distinctly bad effect on the patient's heart, its object being to diminish as much as possible the strain on the kidneys by securing free excretion by the skin.

The treatment up to this point is entirely depletive and is distinctly depressant in its character, and its effect is evidently to concentrate the blood to a greater or less extent, and thus to render the toxines it contains more concentrated. To combat this tendency, as well as for its other action on the system, the administration of normal salt solution has been employed within the last few years, and very good results have followed its use in some distinctly unfavorable cases. It is most efficient if given either subcutaneously or intravenously at a temperature of about 115° F. Its use is not indicated if there is any considerable amount of œdema present. Its action is threefold: first, it acts as a diluent for the toxines, and thus diminishes their irritant action on the excretory organs and aids in their excretion; second, it acts as a direct cardiac stimulant, and in this way also aids in the re-establishment of the renal function; third, the urine increases in amount and improves in quantity much more rapidly under its use than when it is not used. The initial dose should be about two quarts in amount, and it should be repeated at intervals of from two to four hours if necessary.

If the patient is cyanotic and has a full, bounding pulse, venesection may be combined with saline infusion to great advantage, but a fairly large quantity of blood—*i. e.*, ten to sixteen ounces, must be withdrawn to be of any particular benefit. If the heart action is weak, venesection is contraindicated.

The use of morphine as a sedative, instead of chloral, is a point which has caused much controversy in the past, but it would seem

to be fairly well established at the present time that each has a place in the treatment of eclampsia.

Stroganoff's Method. The treatment which has just been described is the method which probably has the greatest number of advocates at present, but within a comparatively recent time another method, radically different in all its essential points, has been advocated by Stroganoff with the report of fifty-eight cases treated without mortality. Our own experience with this treatment has been as yet too limited to furnish any conclusions as to its true value, but any scheme of treatment supported by such favorable statistics demands a thorough trial, because if the results claimed for it can even be approximated, it is a great advance over all previous methods of treatment.

Stroganoff bases his treatment upon an assertion, which the facts certainly tend to bear out, that eclampsia is an acute, self-limited disease, lasting at the most not more than forty-eight hours, unless in rare cases, and that, if the dangerous element in the disease, the convulsions, can be prevented, and the patient's heart action sustained through this critical period, a recovery will take place. He advises the use of morphine and chloral to restrain the convulsions, as follows: morphine, ¼ grain, to be given subcutaneously at the time of the first convulsion, and repeated once or twice at intervals of an hour, according to the severity of the case; the last dose of morphine is to be followed after two hours by chloral hydrate, 20 to 30 grains, given by mouth or rectum according to the condition of the patient.

The chloral is to be repeated at intervals of from four to six hours irrespective of the recurrence of the convulsions, in doses sufficient to keep the patient quiet and drowsy for at least forty-eight hours. If the convulsions recur, the morphine is to be repeated as above. During the convulsion oxygen is to be administered freely, but never ether or chloroform. All external sources of irritation are to be removed as far as possible—*i. e.*, all examinations, catheterization, etc., are best performed under anæsthesia. Forced delivery is to be avoided except in those cases in which it will entail little or no shock, and in those cases in which the other treatment fails to control the convulsions, when it is to be resorted to rather as a final resource than as a routine measure. Hot-air and hot-water baths to produce sweating are in his opinion harmful and never to be employed, the former on account of their depressant action on the heart, and the latter on account of their tendency to bring on fresh convulsive attacks. Stimulants, especially saline infusion, are to be employed whenever indicated. A milk diet is to be prescribed.

From a very limited experience with this method of treatment we would advocate its further trial, but for the present it must be considered as *sub judice* until its true value can be ascertained.

Veratrum Viride. The use of veratrum viride in full doses—*i. e.*, Squibb's fluid extract, ten to twenty minims subcutaneously, repeated if necessary in thirty minutes, and continued in five-minim doses by mouth at intervals sufficiently short to hold the pulse rate at less than 60 per minute—has been highly recommended, and is especially popular in the southern and western portions of the United States. No reliable statistics have as yet been published in regard to its use.

Post-partum Eclampsia. The treatment of post-partum eclampsia differs from that of the other varieties only in the fact that delivery having been already accomplished, the operative treatment is eliminated. It is in this form of eclampsia that our experience with the Stroganoff treatment has been the most favorable.

The disease is such a serious one and the outcome of the given case so dubious that a wise physician will never undertake the care of a case of eclampsia alone, if a consultation can be obtained in any way.

CHAPTER XXIV.

ACCIDENTS OF LABOR.

Presentation and Prolapse of the Funis.

PRESENTATION of the funis is the descent of the cord in advance of the presenting part while the membranes are still intact. Prolapse of the cord is its entrance into the vagina in advance of the presenting part after the membranes have ruptured. The accident is favored by the implantation of the placenta on the lower uterine segment, unusual length of the cord, the insertio velementosa, abnormal presentations, hydramnion, multiple pregnancies, and contracted pelves.

The diagnosis of the condition is easy, since no other intra-uterine body resembles the cord, even though it is pulseless, and because no other pulsating body can appear at the os.

The prognosis for the mother is not altered by the descent of the funis, but the prospects for the child are extremely bad. More than one-half of the children are lost by compression of the cord and subsequent asphyxia, of which there is far more danger in head presentations than in any others.

Presentation of the Funis. TREATMENT. If the cord when discovered is already pulseless, the fœtal heart should be at once auscultated, and if this is not heard an attempt at replacement of the cord should be made. If this fails nothing should be done, the case should be left to nature, and the family informed that the child is dead. If the heart is heard, the presenting part should be immediately raised by upward pressure until pulsation is felt to return in the cord, and carefully retained in its new position until the regularity of the heart-beat is well established before any further treatment is undertaken.

The subsequent management of the case must depend upon the degree of dilatation present. In case the os is rigid and but slightly dilated, the patient should be placed in the knee-chest position, in the hope that the influence of gravity may induce sufficient recession of the presenting part to allow of replacement of the cord under the influence of its own weight. This position should be maintained as long as the strength of the patient permits, and may be aided, if inefficient in itself, by gentle attempts at replacement of the cord with the fingers. In such circumstances, however, the greatest care should be maintained to avoid rupturing the membranes. In case

this attempt at replacement fails the immediate performance of external or bipolar version is to be advised, unless the shape of the pelvis or some other condition contraindicates version.

This manœuvre almost always causes the return of the cord, and, moreover, in case of failure to do this, leaves the child in a position which is especially favorable to rapid extraction, should that be subsequently necessary.

If the os is well dilated when the accident is discovered, postural treatment is to be recommended when the pulsations of the cord are undisturbed. If they have been once arrested, however, more children will be saved by immediate internal version than by any other method of treatment, and this is rendered permissible by the existence of dilatation.

FIG. 206.

Postural treatment of prolapse of the cord. (PLAYFAIR.)

In the performance of version the head should be made to move away from the side on which the cord has descended, in order to avoid a fresh compression during the operation. The cord is usually drawn up as the child turns, but for the sake of safety the patient should be placed upon the side, with the hips somewhat elevated by a pillow, as soon as the operation is completed, in order to favor the retention of the cord, and should maintain that position until the membranes rupture or the breech engages.

If version is contraindicated, a conservative policy is to be advised in the hope that the pulsations may persist until the cervix is sufficiently dilated to permit immediate delivery. The patient should, however, be kept in the latero-prone position, and watched during the interval, while frequent if not constant vaginal examinations should be made, in order to detect injurious pressure upon the cord as soon as it occurs. This plan of delay is, however, much less

favorable to the child, since if the membranes rupture while the cord is still presenting, it descends at once into the vagina, and in head presentations its circulation is promptly stopped by the descent of the presenting part which usually follows a partial escape of the waters.

Prolapse of the Funis. TREATMENT. When the cord has once prolapsed, even though its pulsations are as yet undisturbed, no delay should be permitted. The only treatment which is then possible is either immediate reposition of the cord, or version and rapid

FIG. 207.

Prolapse of the cord by the side of the head. (RAMSBOTHAM.)

extraction. The choice between these procedures must depend upon the circumstances of the individual case.

If the pulsations are regular and strong, and if the os is so small that extraction would be impossible unless it were preceded by manual dilatation, an attempt at reposition should be made, since the time which must be spent in dilatation would seriously compromise the chance of obtaining a living child.

The patient in such a case should be placed in the knee-chest position and the head should be made to recede from the superior

strait by pressure with the fingers, which should then, if possible, return the cord through the os, and if successful in this should urge it entirely beyond the head into the sulcus around the neck. If this attempt succeeds the patient should turn at once upon her side, and every effort made to secure immediate engagement of the head. The uterus should be excited to contraction by manual friction upon the fundus, and suprapubic pressure should be exerted upon the head through the abdominal wall. If digital reposition fails, an attempt may be made to replace the prolapsed portion of the funis by instrumental means, but it is probable that more children will be saved by immediate delivery.

Several forms of repositor have been devised especially for this purpose, but none of them is better than that which can be extemporized from an ordinary English-webbing catheter. This possesses the advantage, moreover, of being always at hand. The catheter should be prepared for use by softening it in warm water until the stylet can be made to emerge from the eye. A loop of sterile string or narrow bobbin should be placed between the point of the catheter and the stylet, and the latter should be withdrawn until its tip again enters the lumen of the catheter, when the loop is permanently attached to the eye, or the bobbin may be threaded through the catheter, as in Fig. 208.

The lowest portion of the prolapsed cord should be made to engage in the loop and should then be returned through the os to the uterus, and as far toward the fundus as the length of the catheter permits.

The stylet should then be withdrawn in order to release the catheter from its position within the loop, for fear that this of itself may arrest the circulation. After the replacement is effected, the head should be made to engage as rapidly and firmly as possible, and the catheter should be left *in situ* until it is expelled with the child, lest its withdrawal should be accompanied by a recurrence of the prolapse. After reposition by either method the fœtal heart should be carefully watched until it is found to become steady and regular. Even those who recommend the use of instrumental reposition would agree that if the first attempt is not successful, or is followed by prolapse of other portions of the cord, it is better to abandon this method and to proceed at once to dilatation and version, since prolonged efforts at reposition almost invariably result in the birth of a stillborn child. If, at the time prolapse occurs, the os is almost fully dilated or dilatable, it is best to etherize the patient and deliver the child by version, unless the prolapsed loop is extremely short, when an attempt at its reposition is admissible, and if successful should be followed by the immediate application of forceps. When compression has once occurred reposition usually fails to save the child, and version is the better operation. In pro-

lapsed cord, version is the operation of choice over forceps because it at once removes the head from the neighborhood of the cord.

When prolapse of the funis is complicated by the presence of a contracted pelvis, the treatment adopted must be determined by the type of deformity present, since in the uniformly contracted pelvis, version offers at best but little chance for the child.

In presentation of the breech and cord the danger of compression of the cord is less than when the head presents, owing to the smaller

FIG. 208.

(KING.)

FIG. 209.

(KING.)

FIG. 210.

(KING.)

size and softer consistency of the pelvic extremity. For this reason, if postural treatment fails, it is fairly safe to remain inactive until the os is sufficiently dilated to permit a rapid extraction, provided the pulsations of the presenting loop are carefully watched in the meantime.

In breech presentations complicated by prolapse of the cord immediate extraction is almost always necessary to save the child.

In face presentations the danger of compression is also comparatively slight during the early stages of labor, but such cases should always be treated by version when complicated by prolapse of the cord, since the small size of the presenting part renders it unlikely to occlude the os to a degree sufficient to prevent recurrence of the prolapse after reposition, which would indeed be likely to take place during the conversion of a face to a head if that were undertaken.

In oblique and transverse presentations the danger of compression is reduced to a minimum. Since such cases must always be treated by podalic version, the occurrence of a prolapsed cord does not alter the indications.

The circulation of the cord may also be interfered with by its being compressed between the limbs and body of the child, or between its thighs, and it seems probable that a large proportion of the stillbirths which occur without an assignable cause are, in reality, due to the compression of a misplaced cord. The diagnosis of this occurrence cannot be made, but the obstetrician will unquestionably save a certain number of children if he maintains a careful watch of the fœtal heart throughout labor, and delivers at once if the fœtal heart-action becomes at all intermittent, even though he is unable to ascertain the cause.

Short Funis. Decrease in the length of the cord may be actual or relative, and due to practical shortening from the coiling of a really long cord around the neck or other portions of the body. In minor degrees of shortening difficulty occurs only after the birth of the presenting part, and it is usually easily remedied by division of the cord, or by slipping it over the head or shoulders, or, in breech presentations, over the buttocks. In the extreme degrees the diagnosis is seldom made until after the extraction of the child, which is usually delivered by operative measures undertaken for the relief of failure of the heart, or for delay from some unknown cause. The condition may result in laceration of the cord, separation of the placenta, or possibly inversion of the uterus. The occurrence of the last accident, though theoretically possible, has not been reported as yet, while the two former are not at all serious if they occur, as is usually the case, during the later stages of a rapid delivery.

Sudden Death of the Mother During and After Labor.

The nervous system of a parturient or puerperal woman is so much more unstable than under ordinary conditions that syncope, unconnected with hemorrhage and due solely to sudden mental shocks, such as excessive fright or grief, is by no means unknown, and has occasionally proved fatal. Syncope, also, not infrequently occurs after the termination of labor, and is then probably due to a

disturbance of the heart caused by the sudden decrease of the intra-abdominal pressure. When occurring in a perfectly healthy woman, though very alarming, it is rarely productive of permanent harm.

The extreme muscular exertion of labor may be the cause of a sudden failure of a fatty or otherwise enfeebled heart, which may even be so extreme as to produce a fatal result. Rupture of the cardiac muscle, or of the aorta or spleen, when already affected by degenerative changes, has also been known to occur during labor.

The most common cause of sudden death at this time, however, is a cardiac or pulmonary embolism. This accident is probably always consecutive to pelvic thrombosis, and generally appears during the later portion of the puerperium and after the appearance of a milk leg. It has, however, been known to follow a thrombosis of the pelvic veins of so slight an extent as to have been unrecognized before the occurrence of the accident, and may then occur early in the puerperium or even during labor.

Another cause of sudden death during or shortly after labor is the entrance of air into the uterine sinuses. Cases are reported in which air has been introduced into the uterine sinuses by the passage of a catheter between the membranes and the uterine wall.

The danger of air embolism is in our opinion much overestimated, and except in cases where the air is forced directly into a uterine sinus is unlikely to occur. The absence of this accident in Cæsarean sections, where the cavity of the uterus is, of course, laid open to the air, is strong evidence that the accident is unlikely. Nevertheless, it is best to take precautions against it.

The assumption of the knee-chest or latero-prone positions immediately after delivery should be avoided, for it is possible that the uterus may be at this time so flaccid as to become distended with air when the patient is in this position, and it might then be sucked into the sinuses. A large proportion of the sudden deaths from so-called air embolism which occur within a few hours after delivery have been recently ascribed to infection of the uterus with bacillus aërogenes capsulatus, or some similar, rapidly growing, gas-producing organism, which, within a few hours from the time of infection, will cause by the gas production which occurs in its growth the changes in the blood which were formerly ascribed to air embolism.

TREATMENT. When death occurs during the later months of pregnancy, or during the progress of labor, it is manifestly the duty of the obstetrician to make every effort to save the life of the fœtus, that of the mother being already lost. If the mother is undoubtedly dead her interests do not have to be considered, and remembering that in calculating the duration of pregnancy a mistake of several weeks is not uncommon, and that children delivered at slightly less than seven months have undoubtedly been saved, it is even right that the family should be urged to give the fœtus the benefit of the

doubt in any case in which pregnancy is supposed to have advanced to six full calendar months.

If the cause of death is such that its occurrence can be anticipated, a consultation should be called as soon as the mother's death is considered to be certainly approaching, and the child should be delivered by rapid manual dilatation and version, if the pregnancy is of eight months or over. On the other hand, children of less than eight months usually die if subjected to rapid extraction through the natural passages, and Cæsarean section gives these children a better chance. Such an operation is, however, to be avoided in cases in which the recovery of the mother is in any way possible, since the danger of an abdominal section or the shock of a rapid delivery would be almost necessarily fatal to her in the condition in which she is. The means of distinguishing a real from an apparent death are so imperfect as to make the position of the obstetrician one of the greatest delicacy, since the symptoms of death usually relied on for medico-legal or other purposes all require a lapse of several hours after the central decease of the patient.

Diagnosis. The diagnosis of the reality of death is seldom difficult when it occurs during pregnancy as a result of an intercurrent fever or organic disease, but in cases of sudden collapse from heart failure or embolism during labor, it must depend largely upon the absence of the heart-beat on auscultation, in conjunction with the existence of symptoms which show sufficient cause for its occurrence. These symptoms are : the sudden appearance of extreme dyspnœa, accompanied by loss of consciousness, and an irregularly tumultuous action of the heart, followed by a cessation of its action, which persists during several minutes of close observation, and they should be considered as sufficient evidence of cardiac failure or pulmonary embolism, and actual death.

Cardiac Disease. If a normal heart is auscultated during strong labor, it is usually found that the increased arterial pressure which is caused by the sudden arrest of the enormously developed uterine circulation during the pains produces murmurs with one or the other sound which cannot be distinguished from those which are the result of valvular lesions. In view of this fact, it would seem that a heart which was the seat of serious valvular trouble could hardly be expected to preserve its integrity under so severe a test. In point of fact, valvular lesions often cause extreme suffering from dyspnœa during labor, but in the majority of cases produce no worse result.

Labor in a patient with cardiac disease is apt to be rapid, because the soft parts are usually resilient and lax. The patient should be permitted to retain the erect position until the moment of delivery is at hand. In extreme cases it may even be necessary to deliver her in a reclining position, with her shoulders propped up on pillows

and her buttocks projecting over the edge of the bed. An assistant should stand on either side and should prevent her from slipping to the floor by seizing a thigh in one hand and a foot in the other.

Labor should be expedited by every means possible. An operative delivery under careful anæsthesia is less dangerous for the patient than a long, hard labor, and ether may be given without fear in all but the most extreme cases, if the cardiac disease is uncomplicated Its use is contraindicated in the presence of pulmonary complications.

Acute Dilatation of the Heart.

As has been recently shown by a series of cases published by Dr. J. M. Jackson, the marked circulatory changes which accompany the process of parturition may result in acute dilatation of the heart, attended by the most alarming symptoms. This condition is most likely to occur in women who have been unable to take the proper amount of exercise during pregnancy, and whose general physical condition is, therefore, not such as it should be to enable them to endure the violent muscular exertions which necessarily attend all but the easiest of labors.

Symptoms. The symptoms of this condition are: extreme prostration, both mental and physical; the pulse is weak and rapid, or intermittent; the face is very pale and has a pinched look; and the patient complains of a feeling of extreme weakness. On careful physical examination the area of cardiac dulness is found to be distinctly increased, and murmurs can usually be heard, showing a relative insufficiency of the valves of the heart. The prostration may, in severe cases, reach such an extreme degree that the patient is practically pulseless, and death seems impending.

Prognosis. The prognosis is almost uniformly good even in the most threatening cases, if prompt measures are taken, but unless the condition is recognized and treated thoroughly the prognosis is serious.

Treatment. Treatment should consist of the prompt and thorough use of cardiac stimulants as in any other form of cardiac failure. Alcohol, strychnine, and digitalis are indicated in all cases, and in severe cases intravenous saline infusion should be employed.

Inversion of the Uterus.

Inversion of the uterus has been described as a hernia of the body through the os, and the condition is very well characterized by Parvin in the expression "the uterus is upside down and wrong side out." The inversion may be complete or partial.

Causation and Prophylaxis. Inversion may occasionally be due to irregular, reversed, uterine peristalsis, or may occur as the

result of the general intra-abdominal pressure when exerted against the fundus of a relaxed uterus, but is usually caused by traction upon the cord or by efforts at expression of the placenta, when these are applied to the partially or wholly relaxed uterus. Its occurrence is to be prevented by the avoidance of expression during relaxation of the uterus and by adoption of the rule never to make traction on the cord.

DIAGNOSIS. The appearance of inversion is signalized by excessive pain, severe collapse, and sometimes hemorrhage, the occurrence of which is dependent upon the existence of complete or partial separation of the placenta. Inspection and bimanual examination

FIG. 211.

FIG. 212.

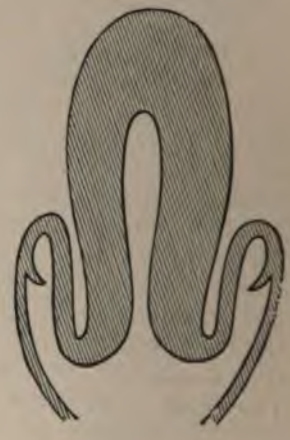


FIG. 211.—Partial inversion of the fundus. (From a preparation in the Museum of Guy's Hospital.) (PLAYFAIR.)

FIG. 212.—Illustrating the commencement of inversion at the cervix. (After DUNCAN.)

will at once establish the diagnosis. Cases have been reported, however, in which an inverted uterus has been mistaken for a uterine polyp and removed, with fatal results; therefore, this possibility of error must be always borne in mind.

TREATMENT. The question of the advisability of the removal of the placenta from its site, if it is still attached, before the reduction of the inversion has been variously answered. It is probably best to complete the detachment, if sufficient separation to cause hemorrhage has already taken place, but to return the uterus and placenta together, if they are still thoroughly adherent, since in this case any attempt at detachment of the secundines may cause a hemorrhage which cannot be arrested until after the return of the uterus.

Replacement is to be effected by making upward pressure upon the fundus with a hand in the vagina, in opposition to counter-pressure applied to the cervix through the abdominal wall. Three methods may be employed: (*a*) the fundus may be received into the palm of the hand, and an effort made to reduce the hernia by the return of the lower uterine segment first and the fundus later; (*b*) the hand may be formed into a cone and applied to the centre of the prolapsed organ, returning the fundus first (Fig. 213); (*c*) or we may adopt the method described by Noeggerath, which consists in applying pressure to the region in which one or the other Fallopian tube enters the uterus. This results in the primary reduction of one lateral half of the prolapse, and the subsequent return of the other. (Fig. 215.) Counter-pressure on the cervix must be employed in any case. After the reduction is accomplished the placenta

FIG. 213. FIG. 214. FIG. 215.

FIG. 213.—Reduction of an inverted uterus by primary return of the fundus.
FIG. 214.—Lusk's method of reduction.
FIG. 215.—Noeggerath's method of reduction.

should be removed by the method already described for dealing with cases of adherent placenta, and the hand should be retained within the uterus until firm contractions are excited, since the accident has a distinct tendency to recur.

Hemorrhage is not always severe, the accident may be overlooked, and thus lead to the condition known as chronic inversion of the uterus, which, however, belongs to the domain of gynecology.

Rupture of the Uterus and Uterovaginal Attachments.

Rupture of the body of the uterus may be produced during either natural or artifical delivery. Rupture of its vaginal attachments commonly results from the use of undue force in the introduction of the hand for version or manual dilatation.

The uterus may be torn in a vertical direction, either through the cervix and lower segment, or at any portion of the body. It may also separate along any horizontal line, and this may be subsequently extended at either end in a vertical direction, but the mechanism by which these two forms are produced is essentially different.

Vertical lacerations of the lower uterine segment may take place by the extension of cervical tears during rapid extraction of the child by forceps, or during manual extraction of the after-coming head. A too forcible passage of the hand or some portion of the fœtus through a constriction ring may also result in a vertical laceration.

Other lacerations of the body are usually due to neglected retraction rings, and their occurrence is the necessary and ultimate result of excessive thinning of the lower uterine segment by retraction of the uterus, when uncompensated by the descent of the child.

The prevention of these ruptures is to be effected by the application of operative interference before marked exhaustion of the uterus has occurred, and by the avoidance of force and the use of careful counter-pressure during the elevation of the head in version.

Rupture of the uterus may or may not be attended by a considerable loss of blood, but is always accompanied by extreme collapse. Its dangers are, primarily, death from hemorrhage or from simple collapse, and, secondarily, a strong probability of the occurrence of general peritonitis at the end of from twenty-four to forty-eight hours. A large proportion of the patients are lost.

TREATMENT. Hemorrhage, if present, may usually be lessened or controlled by securing firm contraction of the uterus. If it is profuse the patient is usually lost before any other treatment can be applied. If, however, it is moderate, but continuous, it may sometimes be arrested, and the life of the patient saved by an immediate laparotomy and suture or removal of the uterus according to the indications found.

In the absence of hemorrhage the treatment must depend upon the situation of the rent and the attendant's confidence in the degree of asepsis which has been maintained. If the asepsis has been careful and if the rent is low down upon the posterior wall, so that efficient drainage of the abdominal cavity can be secured, a large proportion of recoveries may be expected under conservative treatment. This should consist of a careful cleansing and disinfection of the parturient canal, the insertion of a gauze wick through the uterine tear in order to provide for drainage of the peritoneal cavity, and the application of an occlusion dressing to the vulva. Saline cathartics should be freely administered to a degree sufficient to produce as large a number of watery movements as the patient's strength permits, as a precaution against the peritonitis which is sure to develop to a greater or less degree, if the tear of the uterus

has been a complete one—*i. e.*, has extended through the peritoneal covering of the uterus.

If there is any doubt as to the thoroughness of the asepsis observed during labor—and we can never be absolutely certain of our vaginal asepsis—or if the situation of the rent is such that thorough drainage cannot be expected, a laparotomy should be done, the abdominal cavity thoroughly flushed out with normal salt solution, or boiled water, and the edges of the wound pared and sutured by the method of Sänger, or hysterectomy performed, as the operator deems expedient.

The escape of the placenta or child into the abdominal cavity is unfavorable to success by the so-called conservative treatment, and although cases may recover when the child and placenta, with as much blood clot as possible, are removed per vias naturales, true conservatism calls for an abdominal section and cleansing of the peritoneal cavity in all such cases, unless the patient's condition is such as to warrant the belief that the operation will prove immediately fatal.

It is at present an open question whether true conservatism does not call for an immediate laparotomy in all cases of ruptured uterus where the tear extends into the peritoneal cavity, and in which the condition of the patient warrants operation, and whether the apparent conservatism of non-operation is not in itself over-boldness, when we consider the impossibility of excluding the existence of bacteria in the vagina at the beginning of labor.

CHAPTER XXV.

REPAIR OF INJURIES TO THE VAGINA AND CERVIX AFTER DELIVERY.

Cervical Lacerations.

CERVICAL lacerations should be sutured at the close of labor if they give rise to much bleeding, but in the absence of this complication the advantage of primary suture is doubtful, although it is still recommended by some authorities. It may be well in cases in which the laceration extends to the vaginal vault to bring the angles of the wound together, but the importance of free drainage of the uterus is so great that complete repair is inadvisable. It is, moreover, difficult to establish the extent and relations of the laceration in the paralyzed condition of the cervical muscle which obtains immediately after labor.

Small lacerations should be always left to the care of nature unless they cause bleeding, which will seldom be the case.

The method of operating is as follows: No anæsthetic is necessary; the cervix is best brought within easy reach when the patient is in the dorsal position, and she should be placed in the cross-bed position, with the hips well over the edge of the bed; the perineum should be retracted with a large Sims speculum, and the anterior vaginal wall should be held out of the way with a retractor, if necessary; the cervix is drawn well down with a pair of volsella forceps; and the lips of the wound are most conveniently held in contact by a single volsella, one hook being caught in each lip near the lower angle of the tear. The first suture should be placed just above the upper angle of the tear and tied. If properly placed this suture controls the bleeding, and the other sutures should then be placed as in the secondary operation until as much of the laceration has been closed as is deemed advisable, care being taken not to interfere with free drainage of the uterus.

For suture material chromicized or formalized catgut is the most satisfactory, though silkworm-gut or silver wire may be used, but these have the disadvantage of requiring subsequent removal.

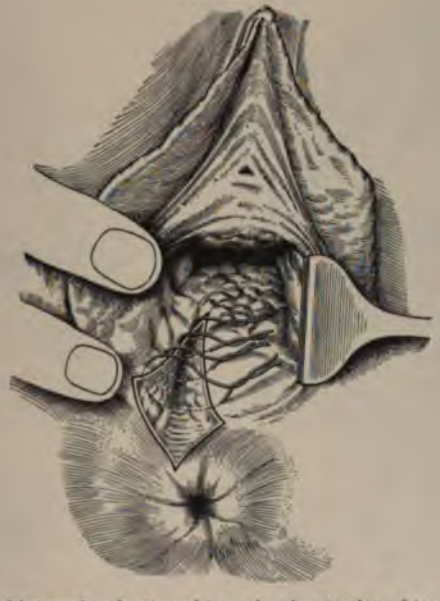
Lacerations of the Pelvic Floor.

In general practice lacerations of importance of the pelvic floor probably occur in at least a third of all primiparous labors and in about 10 per cent. of subsequent labors. This percentage of injuries

is, however, capable of considerable reduction, under proper management of the perineal stage. In skilfully conducted labors the proportion should scarcely exceed 15 per cent. In cases with a relatively small vaginal outlet, narrow pubic arch, unusual rigidity of the pelvic floor, and in cases of rapid extraction, such lacerations must be considered inevitable in a large majority of the cases. It is rare that any primipara is delivered without at least a nick of the fourchette.

The most common form of laceration which occurs is one which runs nearly in the middle line of the skin and superficial structures

FIG. 216.



Superficial combined internal and external tear, showing portion of tear in vagina that may escape notice. (JEWETT.)

and to one side of it in the vagina. Sometimes the tear presents the shape of a Y, with one arm on either side of the median line.

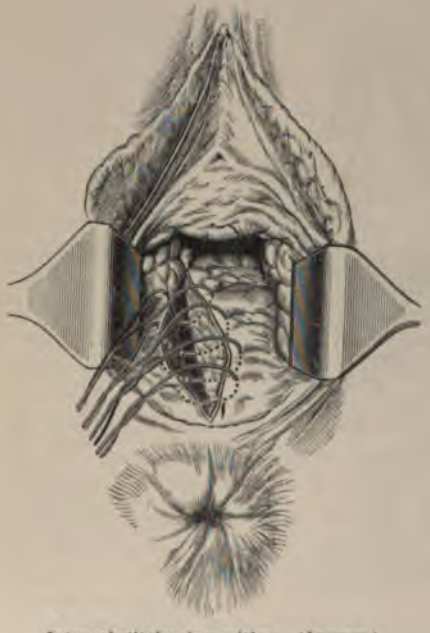
It is very rare to find a median tear extending up the vagina, for the posterior column of the vagina is its thickest portion and, therefore, the least likely to be torn. Extensive tears of the superficial structures may be found in which the tear is entirely in the median line, and does not extend upon the vaginal wall at all. On the other hand, extensive lateral tears of the vagina, which destroy the vaginal support of the uterus, may exist with little or no injury to the external structures. The latter class of lacerations is only to be recognized on careful vaginal examination after delivery, com-

bined with eversion of the vaginal mucous membrane by the insertion of one finger in the rectum.

Unless the condition of the patient at the close of labor is such that any further manipulation is contraindicated, and this is very rarely the case, lacerations of the pelvic floor should be sutured at once, and in the cases where an anæsthetic has been employed during delivery before the patient's recovery from ether, if possible.

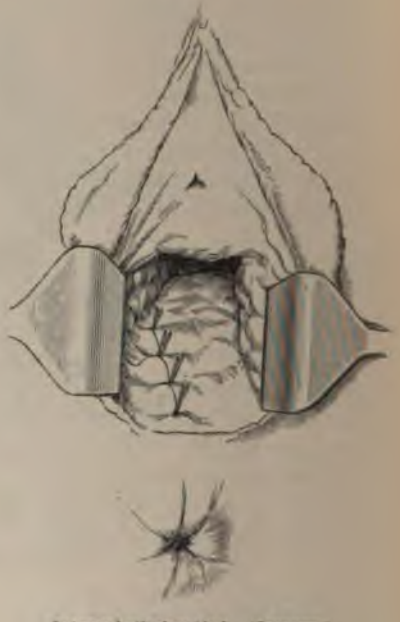
Good union may be obtained, however, if the operation is performed at the end of twenty-four hours, and in the majority of cases

FIG. 217.



Internal stitches in position. (JEWETT.)

FIG. 218.



Internal stitches tied. (JEWETT.)

the suturing may usually be done with success even after so long a delay as a week, if for any reason it has been previously neglected.

After the first twenty-four hours the wound surfaces must be freshened by rubbing them with a piece of gauze, and smoothing them with scissors. When the lacerations are small, or of moderate size, they may usually be repaired during the interval which elapses between the birth of the child and the birth of the placenta. This practice saves time, and often obviates the necessity of a renewal of the anæsthesia, but it is not to be recommended when the laceration is extensive or complicated. In no event should the sutures be tied until after the removal of the placenta.

Suture Material. For ordinary use silkworm-gut or silver wire is the best material for the external sutures, which can be removed later without difficulty, while for the internal sutures some form of catgut, which will absorb in time and not require removal, is the most satisfactory.

Needles. For use in the external and more accessible portion of the wound, long, slightly curved needles are the most convenient; but for placing sutures high in the vagina, fully-curved needles, as short as the depth of the tear permits, are the best.

FIG. 219. FIG. 220.

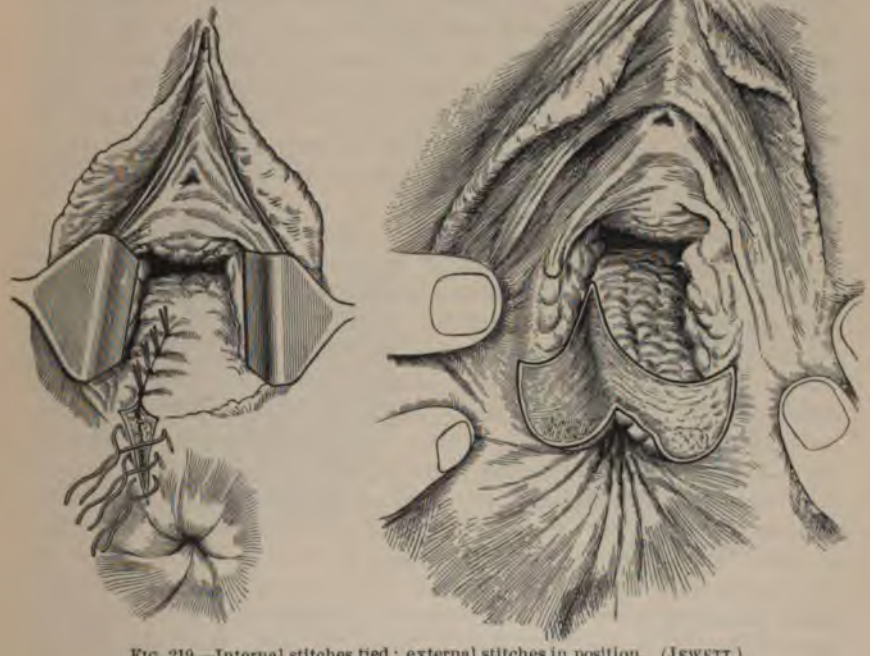


FIG. 219.—Internal stitches tied; external stitches in position. (JEWETT.)
FIG. 220.—Complete tear, involving the rectovaginal septum. (JEWETT.)

Method. In the repair of all lacerations of any considerable size the use of ether to full anæsthesia is advisable. Small tears may be repaired under the influence of cocaine, if for any reason the use of ether is to be avoided; but in these small tears, as the parts have largely lost their sensitiveness from the bruising they have undergone, no anæsthetic may be necessary.

The patient is placed in the lithotomy position across the bed, with the buttocks well over the edge of the bed, or upon a table. The legs are held by assistants or by some appliance improvised for the purpose. Since one of the chief difficulties in determining the

extent and the character of the tear arises from the constant flow of blood over the parts, this should be prevented by packing the portion of the vagina above the tear with sterile gauze, which is to be removed before the sutures are tied. Loose tags of tissue which might become necrotic should be trimmed off with the scissors.

The most common form of laceration, as mentioned above, runs up on each side of the posterior vaginal column, while it is in the median line externally. The aim of repair is to re-establish completely the normal relations of the different structures, but, in the bruised and swollen condition of the tissues it is impossible to recognize the separate structures, except in certain well-defined regions. The levator ani muscle may be torn in one or the other lateral sulcus, and the edges of this muscle, which can usually be recognized, should be carefully sought for and sutured together; but for the other perineal structures the only precaution to be taken is to include the whole depth of the tear in each suture, rather than to run the risk of suturing firmly together tissues which naturally have other relations.

The sutures are to be applied from the skin surface when the depth of the wound thus included in each suture does not exceed an inch and a half. The sutures should be placed about half an inch apart, beginning at the portion of the tear which is nearest the rectum. The needle should be inserted through the skin, about a quarter of an inch from the edge of the wound, passed through the uninjured tissue at the side, and brought out into the wound as close to the bottom of the tear as possible. It should then be inserted at the corresponding point on the opposite side of the tear, and passed in a reversed direction until it emerges through the skin at a point corresponding to that at which it first entered. Care must be taken to avoid injuring the rectum in placing the sutures. The course of the suture should be such that when it is tied it is nearly circular. Each stitch as soon as placed should be tightened as in tying, in order to see if it includes enough tissue to bring the sides of the wound in close apposition throughout the whole depth of the tear. If by faulty insertion any dead spaces are left, the suture should be re-inserted, so as to obliterate them. When all the sutures are in position the gauze packing should be removed and the stitches tied. They should be drawn tight enough to coapt but not constrict the included tissues. In cases of complete rupture of the perineum —*i. e.*, tears which extend through the sphincter ani—the ends of the muscle should be brought together by two or three special sutures. If the muscle is completely torn through, the muscle ends tend to retract deeply into the tissues, and must be carefully sought for; but if the tear extends only partly through the muscle, the ends will be found without difficulty.

In case retraction of the muscle has occurred a depression or pocket which marks the location of the retracted end of the torn muscle may be detected on close inspection on either side of the median line. The end of the muscle should be caught up with a tenaculum, and drawn well out as the suture is passed on either side. The condition of a patient whose sphincter is torn is so deplorable that an immediate attempt at repair should be made in every case whose condition warrants it, and if the primary operation fails a secondary operation should be performed at the earliest possible time.

Tears which involve the vagina to any considerable extent should be sutured on the vaginal surface nearly or quite down to the region

FIG. 221. FIG. 222.

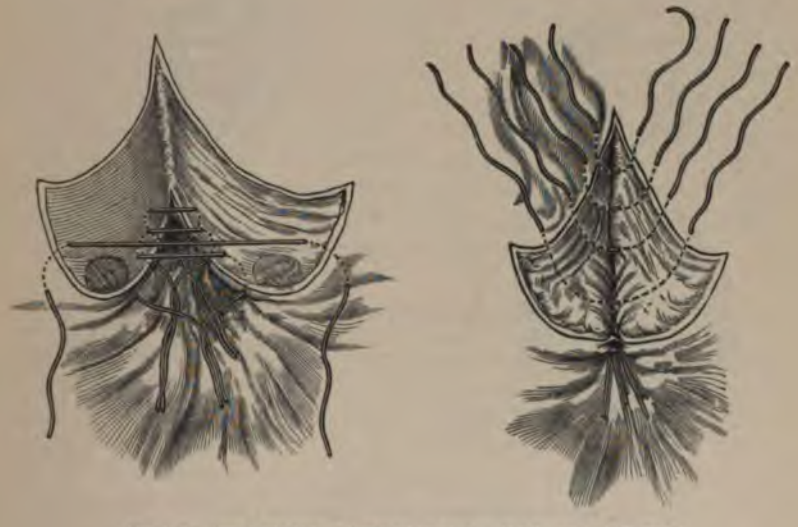


FIG. 221.—Complete tear; closing the rent in the bowel. (JEWETT.)
FIG. 222.—Deep interrupted lifting sutures in position. (JEWETT.)

of the hymen. The rest of the wound is then sutured from the skin surface as already described, the plane of each of the latter sutures being nearly at right angles to that of the skin.

Complete tears which extend into the rectum should be stitched on the vaginal, the perineal, and the rectal surfaces. Owing to the difficulty of removing sutures from the rectum and vagina, the sutures used in these localities should be of catgut or some other absorbable material. The rectal laceration is closed first, the sutures being so placed that when they are tied the knots rest on the rectal mucous membrane. Then the perineal sutures should be placed, but not tied, until after the vaginal sutures have been inserted and tied.

When the laceration does not extend too far up the rectum, in addition to the last interrupted sutures tied in the rectum, which coapt the torn edges of the sphincter ani, a reinforcing stitch passed in the following manner will be useful. One of the retracted ends of the torn sphincter is drawn out by a tenaculum, and the suture is passed through it and then upward along the side of the rectal tear to its apex. It then passes in the reversed direction down the other side through the other end of the sphincter. When tied it tends to coapt all the points in the region of the rectum, and takes the strain off the other stitches. When the operation is completed it is well to dust the line of sutures with iodoform or boric acid,

FIG. 223.

FIG. 224.

FIG. 223.—All sutures laid; vaginal sutures tied. (JEWETT.)
FIG. 224.—Internal and external sutures tied. JEWETT.)

and to renew this application every time the vulvar pad is changed for the first few days.

After-care. There is no need in most cases to tie the patient's knees together, as the increased sensitiveness of the parts acts as a sufficient safeguard against injurious strain on the stitches by separation of the limbs, and the leg binder only serves to increase the patient's discomfort. The bowels should be opened on the second day, as is usual in normal convalescence. The reflex irritation from the stitches may produce retention of urine, but catheterization is to be avoided if possible. The stitches should be removed on the seventh to ninth day unless they seem to be cutting, in which case they should be removed earlier.

If union fails after a careful attempt at immediate repair, it is usually best to wait until the patient has thoroughly recovered from her confinement, and then perform a secondary operation. The description of the secondary operation belongs to operative gynecology and will not be given here.

Vesicovaginal Fistulæ.

These lesions usually appear during the puerperium as the result of sloughing, caused by the continued pressure of the head during an unduly prolonged second stage. The repair is then a matter of gynecology rather than of obstetrics. They may, however, be produced by laceration of the tissues during operative delivery, when they are usually accompanied by rupture of the pubic synostosis. In this event the danger of suppuration makes the existence of every opportunity for drainage so important that it is far better to restrict the immediate treatment to the application of a firm bandage around the pelvis in preference to an operative closure of the rent, especially since spontaneous union is by no means unknown.

In the very rare cases in which laceration of the vesicovaginal septum occurs during labor without rupture of the symphysis, the rent should be repaired immediately by interrupted sutures. This operation requires the utmost nicety and all the precautions which are necessary for the secondary operation.

Other Injuries During Labor.

The straining of excessive hard labor may occasionally produce a rupture of a subcutaneous vein, or lacerations of the superficial alveoli at the apices of the lungs. Rupture of a vein produces extensive ecchymoses, or, if in the loose tissues around the vulva, may give rise to a considerable hæmatoma. No treatment is required in either case unless the walls of the hæmatoma show signs of sloughing from pressure or the effused blood becomes infected. If this is the case, the tumor should be freely incised and its cavity packed with gauze. Spontaneous resolution within a few days is the rule without treatment.

Rupture of the alveoli at the apices of the lungs results in emphysema of the subcutaneous connective tissues, which spreads rapidly and may produce an enormous tumor of the neck and chest. The tumor crepitates on pressure and is tympanitic on percussion. The accident has no bad results except the alarm it occasions the patient. Spontaneous resolution always occurs, and no treatment is necessary.

CHAPTER XXVI.

ABNORMALITIES AND MALFORMATIONS OF THE FŒTUS. ACCIDENTS TO THE FŒTUS.

Multiple Pregnancies.

THE only form of multiple pregnancy which is sufficiently common to be possessed of practical importance is twin pregnancy, which occurs upon an average once in every two hundred confinements. Triplets occur about once in five thousand, and the higher numbers are extremely rare. The occurrence of twin pregnancy may be due to either of two causes. In the one form, two ova are fertilized by the same coitus or by two which occur within a short time of each other.

In the other form the double fœtation is due to the fertilization of a double-yolked ovum.

In the first variety the placenta and membranes are originally separate, and if they fuse during subsequent growth they have no vascular connections.

In the second the two children are contained within a single chorionic sac, and are nourished by a single placenta, the cords being usually separate. Twins developed from two ova may be of the same or different sexes, but those which originate from a single ovum are invariably of the same sex.

Twin pregnancies are usually attended by an excessive development of the symptoms of distention, and are not infrequently terminated by a spontaneous premature labor from this cause.

Presentation. The most common presentation is a double vertex presentation, though presentations of one vertex and one breech are not infrequent.

All varieties of malpresentation are more common than in single pregnancy, the second child being especially liable to malpresentation on account of the greater mobility it enjoys after the birth of the first child. Double breech or even double transverse presentations are sometimes seen. The children are usually small and are often feeble.

DIAGNOSIS. The diagnosis of twin pregnancy is ordinarily difficult and uncertain. The great distention of the abdomen usually renders the results of abdominal palpation inconclusive in the majority of cases, although in a certain number the presence of

three large parts—*i. e.*, two heads and a breech, or two breeches and a head—in the abdomen, two of which can be moved independently of the third, gives a fairly definite indication of the existence of twins.

In some cases an S-shaped sulcus can be seen on the surface of the abdomen, marking the line of separation of the two fœtal sacs.

The evidence from this sign is, however, confirmatory rather than diagnostic. The only absolutely conclusive sign of the existence of twins is the presence of two fœtal hearts beating at different rates, neither of which is synchronous with the mother's pulse.

FIG. 225.

First child presenting by the vertex; second by the pelvis. (PARVIN.) A and B. Points of maxima of intensity of sounds of the fœtal heart.

Conduct of Labor. The first stage of labor is apt to be slow and tedious, on account of the weakness of the uterine contractions, which is due to the extreme distention of the uterine muscle. After dilatation is completed the descent of the first child is apt to be rapid on account of its small size. The first birth is usually followed by an interval of varying length in which contractions are absent and the uterine muscle is chiefly busied in retraction. The birth of the first child may be followed by the expulsion of its placenta, but not infrequently neither placenta is detached until after the delivery of both children.

At the end of from twenty minutes to an hour or more the second child is expelled if its presentation is normal, but its birth may be delayed for a much longer time by uterine inertia.

The distention of the uterus which is usual in twin pregnancies always exposes the patient to a greatly increased risk of post-partum hemorrhage from the atony of the uterine muscle which results from its distention.

If the birth of the first twin is followed by the expulsion of its placenta, if uterine action fails to appear and the os recontracts, and there seems to be no reason why the second child should not be retained in the uterus for some days or weeks, no active treatment should be adopted. This is because numerous cases have been reported in which the second twin has been carried in utero for some weeks after the birth of the first, to be subsequently born with a much improved chance of survival. If the first placenta is not expelled, however, it is unwise to permit this recontraction to occur, since a prolonged retention of the placenta with the cord protruding through the os would almost certainly result in the production of sepsis or of hemorrhage during the interval.

If the second child is to be extracted by the efforts of art, it is far better in the interests of both patients that this should be done in the presence of good dilatation before recontraction occurs.

The best rule in practice is, therefore, that if at the end of an hour the uterus shows no signs of resuming its efforts, and the first placenta is still undelivered, the child should be extracted by forceps if the head presents, and otherwise by version, either operation being extremely easy on account of the small size of the presenting part and the previous dilatation of the passage.

If operation becomes necessary on the first of twins the use of forceps is to be preferred to the performance of version, except in the case of a transverse presentation of the first child. In fact, version is contraindicated on the first of the twins except where, on account of some malpresentation, forceps is impossible, because of the danger of the occurrence of locked heads or of producing such an entanglement of the two cords that one or both children may be lost.

The possibility, in performing version on the first of twins for transverse presentation, that the situation may be complicated by prolapse of the legs of the second child, must always be borne in mind in seizing the leg.

Locked Heads. It usually happens in twin labors that the presenting part of one child enters the pelvis in advance of the other, and if uterine inertia makes it necessary to promote engagement by rupture of the membranes one of the presenting parts should be forced into the brim before the rupture is effected. If the children are very small, it sometimes happens that the head of the second child enters the pelvis alongside of the neck and shoulders of the

first child, giving rise to the accident known as locked heads. This accident may happen in two ways. In double vertex presentations both heads may engage in the pelvis at the same time, or with one but slightly in advance of the other. (Fig. 226.) In presentations of the breech and head, if the breech is permitted to enter first, the head of the second child may occasionally engage in the pelvis in advance of the after-coming head of the first in such a manner that each head is opposite the neck of the other child. (Fig. 227.) Neither variety can occur unless both children are small, but if either occurs it is sure to produce considerable difficulty in spite of that fact.

In double vertex presentations the prognosis is especially bad for the first child, on account of the probability of interference with its cerebral circulation by the pressure of the head of the second child

FIG. 226.

First variety of locked heads in twins.

FIG. 227.

Second variety of locked heads in twins.

against the vessels of its neck. The treatment of the first variety consists in pushing back one head if possible, and, if this attempt fails, in the application of forceps to the first head, and later, if necessary, to the second. This should be followed by perforation or decapitation of the first head, since this child is almost certain to be lost; if the forceps fail in extracting the first head a perforation of the second head is the only possible operation. The diagnosis of the second variety of locked heads is rarely made until after the birth of the first body, when the arrest of the head leads to the introduction of the hand into the vagina and the recognition of the presence of the second head. In this variety the first child is almost never saved, and the second very rarely. When both children are very small both heads may be expelled by the efforts of nature, the

head of the second child being born first, but in almost all cases it is necessary to apply forceps, first to the head of the second child, and then to that of the first. Should forceps fail perforation of the after-coming head of the first child should be attempted, but it is always extremely difficult and sometimes impossible. Decapitation of the first child may make it possible to push back its head. The head of the second child should be spared if this is in any way possible on account of its somewhat better chances of life.

ABNORMALITIES OF THE FŒTUS.

Monstrosities. That strong mental impressions received by the mother during the course of pregnancy may influence the form of the unborn child has always been a matter of popular belief, but it has been received with the greatest skepticism by the profession. The evidence against the possibility of its occurrence has been accumulating until the whole weight of authority is now arrayed against it.

Among the many congenital malformations which are occasionally seen, those which obstruct labor and those which result in the production of children which are so imperfectly developed or so deformed as to be either unfitted for the usual duties of life or incapable of supporting it, are alone of obstetrical interest. All others belong rather to the domain of orthopedic surgery.

The common malformations which may obstruct labor are meningocele, encephalocele, spina bifida, hydrocephalus, and the double monstrosities due to an imperfect division of the germinative vesicle. Those which necessarily affect life are anencephalia and imperforate rectum or anus.

Anencephalia. The deformity known as anencephalia consists of an absence of the cranial vault and of the greater portion or whole of the brain. The sella turcica and base of the skull are exposed to view and covered only by membranes. The birth of an anencephalic fœtus is by no means rare. Hydramnion is usually present, and transverse or breech presentations are not infrequent, and that of the face is common. If the presentation is transverse or pelvic the diagnosis is rarely made until after the extraction of the child, though some such deformity may be suspected from the presence of hydramnion and of other minor abnormalities, such as club feet or hands. If the face presents, the absence of the cranium is usually perceived during the course of the second stage. The body of such a fœtus is often large and well developed, and if the presentation is cephalic, its size not infrequently gives rise to considerable difficulty in its extraction, due, in part at least, to the lack of the preparation of the maternal soft parts which would have been produced by the passage of a full-sized fœtal head.

Such children are occasionally born alive, but as their continued existence is absolutely impossible, no effort should be made to preserve or prolong their lives, and it is a distinctly fortunate result if they die during the process of birth. If circumstances place the matter in the physician's hands, it must be remembered that he must be cautious, because the stillbirth of such a child may alter the disposition of property.

Imperforate Anus or Rectum. DIAGNOSIS. In the absence of the anus the diagnosis is made at sight, but in the more common varieties of the deformity, in which the anus is normal and the imperfection of the canal is within the orifice, the diagnosis is seldom made until the failure of the child to pass meconium and the distention of its abdomen suggests a rectal examination.

The imperfection is not uncommon, and the possibility of such an abnormality should always be borne in mind, and should lead to the passage of the little finger into the rectum of any child which fails to pass meconium within a few hours of birth, since the only possibility of prolonging its life is by a prompt resort to operative measures.

TREATMENT. Conservative treatment is, of course, hopeless. The operative measures which promise the best chance of success are: dissection upward from the perineum, in the hope of finding the upper portion of the bowel, which should then be sutured to the anus, and the dividing septum incised; the performance of a laparotomy to locate the rectum, which may then be brought down and sutured to the anus, and the construction of an artificial anus in the groin or lumbar region. The first two operations are to be preferred in their order, and the last is to be used only in case the others fail.

PROGNOSIS. The immediate prognosis is extremely unfavorable, and even if the operation is recovered from the subsequent condition of the child is apt to be so extremely unfortunate that its survival is usually to be regretted. Brilliant successes are occasionally reported, and these warrant the attempt to save the child in every case.

Meningocele. Meningoceles are cystic tumors outside the cranium and beneath the scalp, which communicate with the intracranial space. They are filled with serous fluid identical with the cerebrospinal fluid. During the latter months of pregnancy they may become separated from the cranial cavity. When such tumors are of sufficient size to cause obstruction to labor their fluid contents should be removed by aspiration with a small trocar or large aspirating needle.

Encephalocele. Encephalocele differs from meningocele only in the fact that the sac contains a portion of the brain tissue, which is spread out in a thin layer over the contained fluid. The prognosis

of encephalocele is always bad, and that of meningocele is better, both from the fact that if the communication with the cranial cavity is very small it may occasionally become obliterated and permit of a recovery, and that cures are sometimes obtained by subsequent operation.

Spina Bifida. The condition known as spina bifida consists of a failure of union of the laminæ of one or more continuous vertebræ and a protrusion through the space thus left of a cystic tumor, whose cavity is continuous with the spinal canal and whose con-

FIG. 228. FIG. 229.

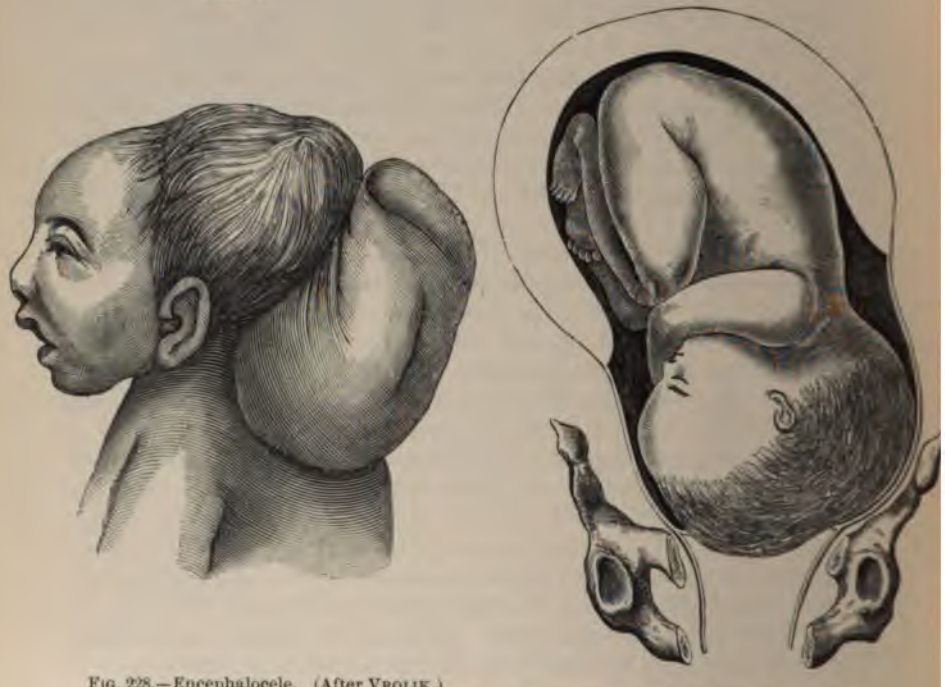


FIG. 228.—Encephalocele. (After VROLIK.)

FIG. 229.—Thinning of lower segment of uterus in obstruction from hydrocephalus. (After BANDL.)

tents is cerebro-spinal fluid. The tumor is usually small. When it is large enough to obstruct labor it should be emptied by puncture without the slightest hesitation, as such children seldom live. When the tumor is small the child may sometimes be saved by a subsequent operation.

Hydrocephalus. Hydrocephalus may be either congenital or acquired, but only the congenital form interests us here. It is due to the presence of an abnormal quantity of intracerebral fluid, and results in the production of an abnormally large and unduly flexible

head. The fluid is usually contained within the dilated ventricles, and is covered by a thin layer of expanded brain substance.

Breech presentations are extremely frequent, but the children seldom survive. Labor is natural in about 25 per cent. of all cases, a result which is due to the fact that the bones are usually but slightly ossified, and that the sutures and fontanelles are so wide as to permit a ready adaptation of the head to the shape of the passage through which it must be forced.

DIAGNOSIS. In breech presentations the diagnosis is rarely made until the after-coming head is arrested at the superior strait, when its size and consistency should at once suggest the cause of delay. In head presentations the diagnosis is usually easy, and is to be made by perceiving that the curvature of the presenting part is abnormally slight, that the sutures and fontanelles are unusually wide and soft, that the bones are extremely flexible, and that the head is abnormally large on bimanual palpation. In extreme cases fluctuation may sometimes be detected.

TREATMENT. Treatment should consist of perforation or puncture and withdrawal of the contained fluid by a trocar or aspirating needle.

The forceps should never be applied to the hydrocephalic head, since they most invariably slip, often with disastrous results to the maternal tissues. In well-marked cases the children never live, and craniotomy may be freely resorted to, unless the religious feelings of the parents or some medico-legal relation, such as the inheritance of property, make it desirable that the child should be born alive, even if it dies at once.

Composite Monsters. Composite monsters are due to a partial division of the germinative area of an impregnated ovum which, if carried to completion, would have resulted in the production of twins. The result may be more or less complete fusion of the heads with separate bodies, or united bodies with separate heads

Fusion of the heads is comparatively rare. When it exists, if the head presents and becomes arrested, the progress of the cases differs but little from that of an abnormally large single head, but if the deformity can be recognized perforation should be resorted to in preference to any prolonged efforts at delivery by forceps, since the continued life of such a monster is hardly possible. In any other presentation a foot should be seized, and the body drawn down until the head is within reach of the forceps. The head should be delivered by forceps, or by perforation if necessary, and followed by the other body.

The more common form of the fusion of the bodies varies in degree from those monsters, on the one hand, which possess eight limbs and two heads attached to a single trunk, to the union of children by a flexible band such as existed in the case of the famous

Siamese twins. As a general rule, the more complete the fusion the less the chance for the ultimate survival of the children. Since such monsters not infrequently live, their lives must be respected, though if death is inevitable it is probably seldom regretted. The birth of such a monstrosity is, of course, only possible when it is of small size. The labors have been natural in about 50 per cent. of the reported cases—a result which is, however, largely due to the great frequency of premature labor.

FIG. 230.

FIG. 231.

FIG. 230.—Puncture of spinal canal in a case of hydrocephalus obstructing labor. (After HERRGOTT.)

FIG. 231.—Sacral tumor. (KELLER: Mütter Museum, College of Physicians of Philadelphia.)

If the heads present, the usual mechanism of delivery is the expulsion of one head while the other is delayed above the brim. The two bodies are delivered more or less simultaneously by a process closely analogous to the spontaneous evolution of transverse presentations, and the second head is delivered last. In such presentations the deformity is seldom if ever diagnosed until after the delivery of the first head, when the mechanism just described should be imitated by the obstetrician.

If, however, the diagnosis is made before the engagement of the head, version should be performed, breech deliveries being much the more favorable for the children. All four feet should be seized and the bodies should be extracted together, and, after the release of the arms, should be swept upward over the abdomen of the mother, when the posterior head commonly enters the pelvis in advance of its fellow, and is delivered first, the anterior head following.

Other Abnormalities of the Fœtus. An abnormal increase in the size of the fœtus may offer a serious obstruction to delivery. This may be due to symmetrical enlargement of the child; to the existence of an abnormally large or over firmly ossified head, or to enlargement of the body with a normal head.

Symmetrical Enlargement. Symmetrical increase of the fœtus may result, according to its degree and the size of the individual pelvis, in the necessity for forceps or version, or in rare cases for craniotomy. The major operations are rarely justified in the absence of contraction of the pelvis.

Excessive ossification not infrequently causes a difficulty in the delivery of the head, which is due to the inability of the cranial bones to yield to the moulding processes of labor, and which may result in the obstinate arrest of a comparatively small head.

If at the time when the arrest occurs the head is already in the excavation, forceps should be applied, and this the more readily since such children are usually able to endure extremely powerful tractions without harm, because the brain and cerebral circulation are to a great extent protected from pressure by the non-yielding character of their envelopment. If the head is arrested in or above the superior strait, version is usually the better operation, since it is practically certain that a greater or less amount of moulding is a necessary preliminary to the passage of the head, and this is more likely to occur during the passage of the after-coming head for reasons that have already been explained.

Excessive Size of the Body. Excessive size of the child's body is not an infrequent occurrence. Delay of the body after the delivery of the head justifies the use of a very considerable degree of force in the use of the ordinary methods of extraction, for the double reason that the soft body of the child is unlikely to cause a serious lesion of the more important soft parts of the mother, and that the risk of injury to the child is less important than the certainty of its asphyxiation, if not promptly delivered. When the size of the fœtal body is so extreme as to cause arrest of the shoulders at the superior strait while the head is in the excavation, it usually results in the loss of the child by craniotomy or during prolonged efforts at extraction with forceps. It may sometimes require the application of the cranioclast or cephalotribe to the thorax and shoulders, or

in extreme cases amputation of the arms or shoulders by means of the écraseur or decapitating hook or knife.

Tumors of the Trunk. Ascites, anasarca, hydrothorax, and post-mortem emphysema, or an enlargement of the abdomen due to an imperforate condition of the bladder or ureters, may result in arrest of the body, but the diagnosis is usually made only after the introduction of the hand. The treatment should be always limited to exenteration, since the prognosis for such a child is hopeless. The opening may be made by the use of the scissors, knife, or trocar, according to the accessibility of the obstruction.

ACCIDENTS TO THE FŒTUS.

Asphyxia Neonatorum. Asphyxia neonatorum is caused by a deficient oxygenation of the blood, due to compression of the cord during the course of labor, and may be complicated by a depressed condition of the respiratory centres due to anæmia of the brain from pressure.

There are two varieties of asphyxia, or rather two degrees of severity: blue asphyxia, in which the pulse is slow and strong, the muscles more or less rigid, and the child cyanosed; and pallid asphyxia, in which the pulse is rapid and feeble, the muscles are flabby—*i. e.*, the head, limbs, and lower jaw drop limply, and the child is pale and anæmic. The latter form may be complicated by the presence of liquor amnii in the lungs, if the cerebral anæmia is profound enough to cause respiration in utero when the mouth was in contact with the liquor. Blue asphyxia is followed by pallid asphyxia unless respiration is soon established.

TREATMENT. *Prophylaxis.* The anticipation of asphyxia by means of frequent examinations of the fœtal heart with the stethoscope, and prompt delivery when it is found to be either steadily increasing in rate or intermittent, and care to flex the wrist of the internal hand during the extraction of the after-coming head to an extent which permits the outside air to have free access to the child's mouth, will greatly diminish the number of severe cases of asphyxia which require treatment.

Resuscitation. The means of resuscitating asphyxiated infants consist of expedients for exciting natural respirations and the various methods of maintaining them artificially.

The methods in use for exciting respiration are all founded on the view that although the first respiration may occasionally be provoked by the alteration of the circulation which occurs at birth, it is usually a reflex result of the stimulation of the cutaneous nerves, which follows the removal of the child from a warm fluid to comparatively cold, dry air. This belief rests upon the results of experi-

mental research in animals, in which it has been found that when the uterus is opened and the cord tied, or when the placenta is separated in utero without in any other way disturbing the fœtus, respirations are sometimes excited by the cerebral anæmia which results from the cessation of the utero-placental circulation, but that in the majority of cases the fœtus dies without making any attempt to fill its lungs. On the other hand, if the uterus is perforated, and the skin of the fœtus is scratched or otherwise stimulated, or if it is removed from the uterus and exposed to the air with as little manipulation as possible and without interference with its circulation, respiration is uniformly excited, the method of removal from the uterus being the most efficient.

All methods of artificial respiration, on the other hand, are attempts to produce expiration by compression of the chest, and inspiration by causing expansion of the chest by traction of the ribs through the pectorals and other auxiliary muscles.

In blue asphyxia the stimulative methods are usually all that are needed, and in the majority of cases simple stimulation of the external skin is sufficient to awaken respiration. Great care must always be taken to maintain the body heat throughout the process and to avoid the exhaustion of too much manipulation.

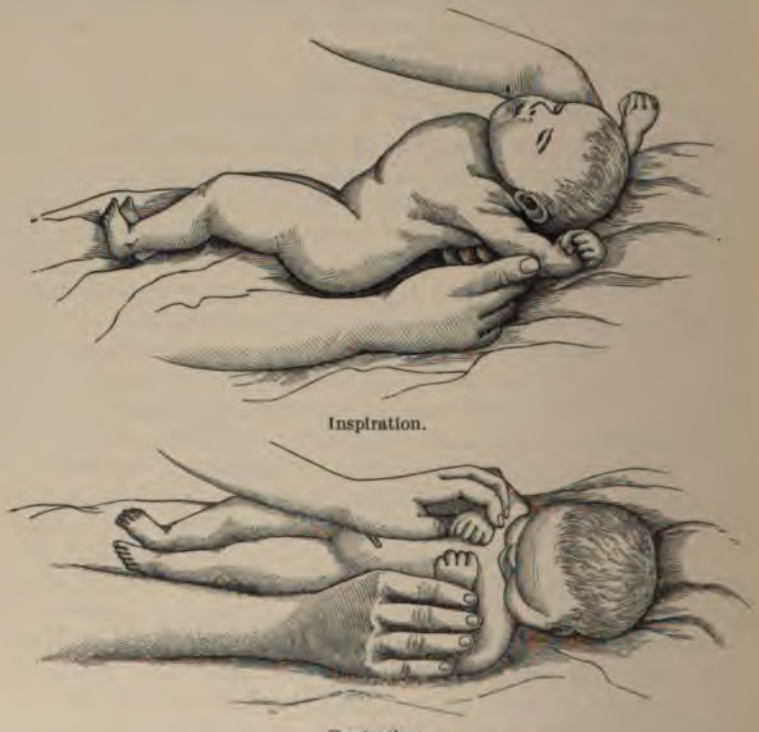
The child should be held head downward, the mouth and fauces should be cleared of mucus by the fingers, and this position should be maintained for several seconds, in order to favor the drainage of any liquor amnii which may have been swallowed or drawn into the trachea. The infant should then be completely immersed, with the exception of its face, for several minutes in the hottest water which can be borne without scalding, removed for a brief plunge of a few seconds into ice-cold water, and at once replaced in the hot water to prevent a serious loss of body heat. If any attempt at respiration is excited during this process, it should be persevered in, and then usually results in the production of good respiration. When respiration has become regular and sufficiently frequent, the child should be sharply slapped with the hand or with the fringes of a wet towel until it cries vigorously, in order to secure complete inflation of the lungs. Care must be taken, however, not to bruise its tissues. The back and buttocks are the preferable regions for this slapping. In the milder cases of pallid asphyxia the same process is often successful, but care should be taken to hold the child with the head downward, not only during the process of slapping, but whenever opportunity permits.

The inverted position is of great value in these cases, because it favors the gravitation of blood to the head with consequent relief of the cerebral anæmia. This is of the greatest importance, because if the first stimulating effect of the deprivation of blood fails to arouse the respiratory centres, their revival is hopeless while the

local anæmia continues. In pale asphyxia, especially, all manipulations and rough handling of the child should be reduced to a minimum, as a marked degree of exhaustion is to be expected in all such cases, and the vitality of newborn infants is so low that a very slight increase of shock may be promptly fatal.

If the case appears serious, no great time should be lost in trying these methods, but artificial respiration should be at once resorted to and maintained until the child breathes regularly without aid.

FIG. 232.



Inspiration.

Expiration.

Sylvester's method of artificial respiration.

In pale asphyxia, uncomplicated by aspiration of fluid, a large proportion of children may be saved by artificial respiration, provided that the heart is still beating and that the inverted position is persistently adhered to. When pale asphyxia is complicated by inspiration of the liquor amnii, the prognosis is extremely grave. However, since apparently hopeless cases are sometimes saved, artificial respiration should be persevered in for at least half an hour. When any considerable amount of liquor has been inspired, the only chance of resuscitating the child is to secure drainage of the

fluid by holding it with its head downward for many minutes, assisting the action of gravity by artificial respiration.

Artificial Respiration. *Sylvester's Method.* The child is laid upon a table or other flat surface with its back slightly arched over a folded towel or other compress. (Fig. 232.) The operator grasps a forearm in each hand, presses them lightly against the lower part of the chest, and then extends them fully by the sides of the head, in order to cause inspiration by raising the ribs by traction upon the auxiliary muscles. The motions should be repeated from six to ten times a minute. The method has the advantage of reducing the handling of the child to a minimum, but is somewhat inefficient.

FIG. 233.

Schultze's method—inspiration. (JEWETT.)

Schultze's Method. In this procedure the child is suspended by the arms with its back toward the operator. Each arm is held by a thumb and forefinger, while the other fingers support the back as in Fig. 233. The child is then swung sharply upward into the position shown in Fig. 234, and after a few seconds the first position is resumed. In the first position the traction of the head and neck upon the auxiliary muscles tends to elevate the ribs, which in the second position are depressed by the forward flexion of the whole body. This method exposes the child to considerable risk of exhaustion from the somewhat rough handling it involves, but is thoroughly efficient, and is to be recommended for mild cases.

Authors' Method. This possesses the important advantage of combining a most efficient artificial respiration with a minimum degree of manipulation and with a constant maintenance of that

most important factor, the inverted position. The pelvis of the child is encircled by the thumb and little finger of one hand, while the other fingers support the back. (Fig. 235.)

In this position the weight of the dependent head and arms produces the fullest possible expansion of the chest. At brief intervals the other hand is passed across the chest, and the second and third fingers are hooked along the opposite sides of the neck, when by light pressure of both hands the child's body is sharply flexed, and the chest is firmly compressed. (Fig. 236.)

FIG. 234.

Schultze's method of artificial respiration—expiration. (JEWETT.)

This method is especially valuable in cases in which mucus or liquor amnii has been inspired, and the fluid can usually be observed to drip from the mouth and nose under the influence of gravity during each compression of the chest. When this is seen the little finger of the anterior hand should be made to clear the mouth and fauces of the child at the end of each movement of expiration.

Byrd's Method. This method has the advantages of being simple and efficient, without subjecting the child to unduly rough handling.

The child lies upon its back on the palmar surfaces of the operator's outstretched hands. (Fig. 237.) Expiration is produced by doubling the child's body on itself (Fig. 238), while inspiration is produced by permitting the body of the child to return to a position of extreme extension.

Faradism. The application of the faradic current to the chest is a method of great value, and if a battery is at hand should be given a trial. One pole should be applied constantly over the phrenic nerve, just outside the origin of the sternomastoid muscle, and the other brought into momentary contact with the chest wall at intervals of from ten to twenty seconds. The contact must be made as brief as possible, since any over-stimulation of the respiratory nerves

FIG. 235.

Reynolds' method—inspiration.

FIG. 236.

Reynolds' method—expiration.

may result in their paralysis. Each inspiration which is produced by the electricity should be succeeded by manual compression of the chest between the hands of the operator, to ensure the expulsion of the inspired air.

Mouth-to-mouth Insufflation. When the child cannot be induced to breathe by the methods described, mouth-to-mouth insufflation should be tried. In this procedure the fauces are cleared by the little finger, and the child is laid upon its back upon a table, its face and nose being covered by a thin towel. The operator clears his lungs of residual air, inflates them, and placing his mouth to the face of the infant in such a manner that both its nose and mouth

are included within it, gently expels a little air from his lungs into the respiratory tract of the child. Each inflation must, of course, be followed by compression of the chest with the hand in order to produce expiration.

This method is often valuable, but possesses the disadvantages that a too vigorous expiration may cause lacerations of the pulmonary tissues of the child, and that the air expired from the attendant's lungs often passes into the œsophagus and stomach instead of into the lungs.

FIG. 237.

Byrd's method—inspiration. (JEWETT.)

Catheterization of the Trachea. If mouth-to-mouth insufflation fails, catheterization of the trachea should be tried. The forefinger is passed into the mouth until it reaches the larynx and feels the arytenoid cartilages, and a small (No. 10 F.) English-webbing catheter is passed along its flexor surface and guided through the glottis. The operator then blows gently into the catheter after having expelled the residual air from his own lungs, taking care that the amount of air which he expires is no more than the small quantity that the lungs of a newborn infant can contain. When executed promptly and with sufficient caution against any over-inflation of

the infant's lungs, this method is extremely valuable. The introduction of the catheter is not always easy, however, and the element of time is of so much importance that the more ready methods are ordinarily to be preferred. Such a catheter should always, however, be carried in the obstetric bag for use after the failure of other means.

If this is not promptly successful the withdrawal of the catheter should be preceded by a gentle suck, as this may dislodge mucus, and so clear the air passages.

FIG. 238.

Byrd's method—expiration. (JEWETT.)

When the excitation of breathing is difficult, and the heart action is perceived to be failing, both processes should be stimulated by the hypodermic administration of from five to ten drops of brandy or ether.

During the process of artificial respiration loss of body heat should be prevented by occasional immersions in hot water, and when regular voluntary inspiration has been established, but not before, a plunge in the cold water may occasionally be resorted to as an additional stimulation. The artificial respirations should be produced at regular intervals until natural breathing is established. The child should then be wrapped up warmly, watched carefully,

and handled as little as possible for several days, for even after it has been made to cry vigorously, its future prospects are less bright than those of an unasphyxiated child, nearly 50 per cent. of such infants dying within the first week.

Accidents to the Fœtus During Labor.

Forceps Marks. The marks sometimes made by the forceps during an operative delivery may be deep or superficial. The superficial injuries are nothing more than a separation of the scarf skin, due to forcible friction of the blades against the head during their introduction or to their slipping during traction. These marks are extremely disfiguring at the moment, but require no treatment and leave no scars.

Any undue compression by the forceps may result in the production of subcutaneous bruises of the face or scalp. These appear as indurated subcutaneous phlegmons, which feel like hard buttons beneath the skin. Like the more superficial marks, they need no treatment, and never result in a scar.

Facial Paralysis. When the forceps are so applied that the tips compress the facial nerve against a bone at its origin from the skull the pressure may result in the production of a temporary paralysis of the muscles it supplies. The paralysis is usually unilateral, and generally disappears without treatment in less than a week. In the rare cases in which both sides are affected, it may cause inability to nurse, which may result in starvation before the nursing function is re-established, unless the child is fed by the injection of milk through a soft-rubber catheter passed into the stomach. By this means, however, it is easy to sustain life until the affection disappears.

Fracture of the Fœtal Skull. This accident is usually the result either of the unduly rapid forcible delivery of a large head, or of some violation of the proper mechanism of labor during an operative delivery. These children are usually stillborn from some injury to the brain, and, even if born alive, are apt to die of meningeal hemorrhage within a short time.

Meningeal Hemorrhage. The excessive overlapping of the flat bones of the skull which necessarily occurs during difficult labor may occasionally during natural, but more often during operative delivery, result in laceration of the dura mater and of the vessels it contains. Its results depend upon the situation of the tear and the size of the lacerated vessels. It is more serious when the tear is situated at the base of the skull than in any other region.

When this accident has occurred the compression of the cerebral substance has usually been such that the child is extracted in a condition of pale asphyxia. If the injury to the meninges is severe,

the diminution of the intracranial pressure which is consequent on delivery is usually followed by the occurrence of a hemorrhage which is sufficient to destroy life before respiration starts. In less extensive lacerations respiration may be excited, but only to become progressively slower and more feeble until death occurs. In these cases a post-mortem examination shows the presence of a clot of extravasated blood at the base of the brain. When the hemorrhage is sufficient to cause death, the child is usually feeble and apathetic for a long time. Its recovery may finally be complete, or it may be followed by the appearance of a spastic hemiplegia or other par-

FIG. 239.

Lateral pressure on anterior thigh during the expulsion of a posterior position of the breech.

alysis, which may develop immediately or after an interval of one or more years.

Fractures of the Upper Arm and Clavicle. It is not uncommon during difficult extractions of the after-coming head and arms, and occasionally in difficult extractions of the body in head presentations, for fractures of the upper arm or clavicle to be produced. These fractures are, of course, usually of the green-stick variety.

Fractures of the clavicle may be left untreated, since they rarely result in any permanent deformity, and treatment in any event may be restricted to immobilization of the arm on the affected side by the application of a sling and circular bandage.

Fractures of the upper arm would probably unite spontaneously if untreated, and are seldom followed by any bad results unless the fracture involves one of the epiphyses of the humerus. If this is the case the subsequent growth of the humerus may be interfered with, and the accident then results in a shortened arm. The treatment should be confined to straightening the affected bone and confining it between splints of moderately thick pasteboard, or mere compresses of folded cloth. The arm should be lightly bound to the side, but care should be taken that the bandage is not sufficiently tight to compress the chest and interfere with respiration.

Fractures of the Thigh. These are usually incurred during the extraction of the breech in cases in which the legs are extended across the chest. The anterior thigh is usually the seat of the injury. It will be seen by reference to Fig. 239 that in posterior positions of the breech the anterior thigh is necessarily exposed to considerable lateral pressure from the edge of the symphysis during the lateral flexion of the trunk which accompanies the expulsion of the hips.

It can be readily understood that the mere insertion of the finger into the groin may increase this pressure sufficiently to cause fracture unless the hips are at the same time pressed backward.

Injudicious traction in the direction indicated by the arrow would certainly be followed by the accident. The prognosis and treatment are identical with those of fracture of the humerus.

PART VI.

THE PUERPERIUM.

CHAPTER XXVII.

NORMAL CONVALESCENCE.

THOUGH convalescence from labor is a physiological process, it must not be forgotten that the puerperal woman is not in a condition of ordinary health, and that although the normal puerpera is not ill, she is in a state of markedly unstable equilibrium in which her sensibility to the conditions of her environment is very greatly increased, and in which very slight external stimuli, either physical or mental, result in entirely disproportionate disturbances of her pulse, temperature, and general condition. Under the most favorable circumstances the pulse is usually slightly higher and more variable than in health. The temperature in the absence of complications should remain below 99° F., but very slight disturbances of the health may produce a degree of pyrexia which would be considered entirely disproportionate at any other time. It is, therefore, necessary that the cause of every rise of temperature, however slight, should be carefully diagnosed. The usual causes of an elevation of temperature which is independent of sepsis are constipation, inflammation of the breasts, a disturbed condition of the nervous system, and intercurrent systemic diseases.

Rest and Quiet. The occasional occurrence of a distinctly high temperature during the puerperium from functional disturbances of the nervous system, uncomplicated by any other condition, is a phenomenon which has been so frequently observed as to be beyond reasonable doubt.

Since the condition of the nervous system is such that very slight causes may produce a marked and lasting excitement, it is an important part of the duty of the attendants of every puerperal woman to guard her rest and shield her from nervous excitement in every possible way. It is for this reason that labors which result in stillborn children are apt to be followed by a protracted and troubled convalescence; for this reason, also, a rigid exclusion of

visitors from the room of the patient during the first week after delivery is to be recommended. The best routine is to permit the patient's husband to visit her twice daily for a few moments, and her mother, if present in the house, to see her once. Both should be warned to reduce their conversation with her to a minimum, and especially to avoid all topics which would in any way interest or excite her. This is the proper rule, but the conditions of family practice are such that the physician may be obliged to relax its vigor somewhat, so long as the convalescence is normal. It should be strictly enforced whenever the nervous condition of the patient is anything but satisfactory.

Nothing exerts a more important influence upon the whole course of convalescence from labor than the manner in which the patient passes the first few hours after the birth of her child. It must be remembered that at the close of parturition the mother is exhausted, not only by the extreme and prolonged muscular efforts of labor, but by the continued endurance of extreme pain; and that although she is often excited and exultant in her sense of relief from pain and of possession of the baby, she is, nevertheless, in urgent need of both physical and mental rest. It is, therefore, important that from the very moment of delivery the room should be quiet and the attendants should maintain a calm, collected, and soothing manner, and should avoid all unnecessary conversation with each other or with the patient. The baby should not be urged upon the patient's attention until she asks to see it. It should then be shown to her for a moment and removed to the next room. The physician should himself remain within call, and should see that the nurse arranges the dress and bed of the patient and removes the paraphernalia of labor as quickly and quietly as possible. The room should be darkened, the whole house maintained in as noiseless a condition as possible, and the patient urged to make a determined effort to obtain the rest she needs so much. If she seems restless or excited it is frequently good practice to administer at once a mild hypnotic, such as 20 or 30 grains of bromide of potassium.

The nurse should be ordered to remain in the next room, and forbidden to absent herself for a single moment from the sound of the patient's voice, that there may be no possibility of her failing to secure aid in case of faintness, secondary hemorrhage, or any other emergency.

A recently delivered woman thus treated seldom sleeps profoundly, but will doze and rest for many hours, and has a much better chance of a normal and comfortable convalescence than if she had been subjected to the congratulations and inquiries of bustling friends and relatives.

The Binder. The use of the binder after confinement is almost universal in this country. It has been strongly objected to by some

authorities, on the ground that the compression which it exerts tends to produce or favor the production of a low position or even of a retroversion of the uterus. Though this objection is certainly valid if the binder is applied with injudicious tightness, it is, on the other hand, probable that a moderately snug bandage relieves the relaxed abdominal walls from the pressure of the abdominal viscera, and thus favors the necessary involution of the abdominal muscles. What is more important still is that it promotes the comfort of the patient and permits her to change her position freely without that risk of the entrance of air into the vagina or uterus which must always accompany the accidental assumption of Sims' position in the relaxed condition of the abdomen of a recently delivered woman, and thus removes one possible source of infection.

Position in Bed. The position which the puerperal woman assumes in bed is unimportant so long as it is frequently changed. Since many women from fear of injury persistently maintain a constrained position upon the back, unless distinct permission to move about is given them, the physician should be careful to inform each patient that she will rest better and convalesce more rapidly if, after the first few hours, she turns frequently from one position to another.

Few things are more unfavorable to physiological rest and to the progress of involution than the discomforts of an unvaried position, and every patient should be informed that the assumption of a lateral decubitus is distinctly an advantage on account of its tendency to promote free drainage of the accumulated lochia from the vagina.

Post-partum Chill. A large proportion of patients are subject, within a few moments after delivery, to a slight chill, which is especially common if the exigencies of the case have necessitated a somewhat free exposure of the person. The phenomenon is of no importance, and is, indeed, rather a favorable event than otherwise, since post-partum hemorrhage rarely occurs in a patient who has had a chill. As it is likely to alarm the patient, care should be taken to inform her that it is a favorable rather than an unfavorable event.

After-pains. After-pains are due to a continuance of the intermittent contractions after the birth of the child. They are, therefore, likely to be most severe after short and easy labors, in which the contractility of the uterus is only partially exhausted. For this reason they are comparatively rare in primiparæ. They seldom occur in a thoroughly emptied uterus, but they are always present when the uterine cavity contains clots or portions of placenta.

Prophylaxis forms the most important element in the treatment of after-pains, and it will be found in the vast majority of cases that if the attendant makes it his practice in all cases to hold the uterus after delivery until retraction has taken place, to promote contrac-

tion by constant friction over the fundus during this time, and to prevent the accumulation of clots in the uterine cavity, after-pains will be entirely absent or very mild in character. If, in spite of these precautions at the time of delivery, after-pains subsequently develop to a degree sufficient to annoy the patient seriously, their treatment must consist of a repetition of the treatment just advised, in order to secure the complete emptying and contraction of the uterus, and the application of measures to quiet the pain in the meantime. If from its size the uterus is supposed to contain any considerable quantity of clots, the friction should be followed by an attempt at expression after the manner of Crédé. When the uterus has been emptied in this way, the administration of a drachm of ergot, to which ten minims of laudanum have been added, will always lessen and sometimes permanently stop the pain within a short time. If the attack has been severe, retraction should be maintained by the continued use of ergot in doses of from twenty to thirty minims at intervals of from four to eight hours for several days. A useful and comforting additional treatment is the application to the lower portion of the abdomen of compresses wrung out in stinging hot water, and frequently changed.

Ventilation. The popular impression of the extreme danger of "taking cold" during the first week of convalescence arises without doubt from the frequency with which the development of uterine sepsis is accompanied by a chill and from the mistaken pathology of former days which ascribed the chill to an accidental exposure of the patient to a draught. In reality, nothing is more important during convalescence from labor than a free supply of fresh and fully oxygenated air, and it is the duty of the physician in all cases to be watchful lest the prejudices of the family or monthly nurse should expose the patient to the pernicious effects of a foul, ill-ventilated room.

Cleanliness. It is a traditional belief that combing or brushing the hair of a woman during the first week of convalescence from labor exposes her to increased risk of hemorrhage. This prejudice probably arises from the fact that the muscular fatigue caused by the patient sitting up in bed to perform this duty herself would certainly predispose her to such an occurrence. Careful arrangement of the hair by the nurse, without allowing the patient to rise in bed, can be productive of no harm, and should always be permitted and enjoined. The hands and face should be washed by the nurse at least twice daily, and the body should be sponged from top to toe with tepid water at least once every day. In warm weather, especially if the patient is stout, the groins, axillæ, and any other folds in the skin should be thickly dusted with baby powder.

Anæmia. Though it has been proved that what was formerly supposed to be the physiological anæmia of pregnancy is only tem-

porary, it must, nevertheless, not be forgotten that many women, especially among the upper classes, are reduced during pregnancy to a condition of anæmia which adds greatly to the exhaustion of parturition, and leaves them in a condition peculiarly ill-suited to sustain the fatigues and risks of the puerperal state. This condition, when present, should be steadily combated during pregnancy, though little more can be hoped for at that time than to arrest its progress. During the puerperal period, however, much may be gained by a systematic administration of iron in full doses as soon as the bowels have been moved freely. This treatment, in combination with a generous diet and a moderate use of stimulants, preferably in the form of malt liquors, will rapidly effect a marked improvement in such a patient's condition.

Routine of Treatment During Convalescence. During normal convalescence the physician should not only keep a record of the pulse and temperature, but should maintain a careful supervision of the five functions of defecation, micturition, establishment of lactation, involution of the uterus, and the excretion of the lochia, since any alteration in the course of the puerperium is attended by a variation from the normal in at least one of these particulars. He should, therefore, at every visit examine the breasts; estimate the size, consistency, and tenderness of the uterus by abdominal palpation of the fundus; inspect or inquire about the quantity and odor of the lochia as collected upon the pads, and ask about the regularity of the bowels and urine.

Diet. The digestion of a puerperal woman is, like all her functions, easily upset, and must be carefully watched. Her appetite during the first few days is usually very slight, and even later is rarely large; but as her return to her normal condition of strength is largely dependent on the amount of nourishment she receives, a generous diet is to be advised from an early period. It is usually well to administer a hot drink—*i. e.*, hot milk, flour gruel, or some similar food—as soon as the patient has sufficiently recovered from the immediate fatigues of labor to care for it. From this time on the diet should differ in no way from that which is given to a patient after an ordinary surgical operation, that is, it should be restricted until after the bowels have been thoroughly opened—*i. e.*, until the second day—and then increased to a generous diet; but it must not be forgotten that the digestion is sensitive and rather easily upset at this time. From this time on the diet need differ in no way from what the patient is accustomed to in ordinary health, and the only rule is that articles of food which are apt to upset the patient in health must be avoided. Throughout the period of lactation fruit must be used sparingly, and it may also be found in some cases that certain customary articles of food will upset the baby by the changes they produce in the milk, and these idiosyncrasies must be corrected

in the individual case by the avoidance of the disturbing foods from the time when the discovery is made.

Bowels. The bowels ordinarily fail to move spontaneously during the first few days after delivery, and should be opened by a cathartic within thirty-six hours of the time of delivery. Owing to the excessive accumulation of fecal matter which often takes place in the lower bowel during the latter part of pregnancy, it is usually best to assist the action of the cathartic by the administration of a copious suds-and-glycerin enema. Overlong neglect of the bowels after labor is often attended by a rise of temperature, is productive of distinct discomfort to the patient, and is likely to retard her convalescence. Constipation, moreover, predisposes to the appearance of hemorrhoids. The administration of the cathartic should be preceded in neglected cases by a high injection of from one to four ounces of olive oil to soften the fecal masses in the rectum.

The preferable way of administering a cathartic at this time is by repeated small doses of some non-poisonous drug. The cathartic which the patient is in the habit of using is ordinarily the best for use at this time, though the ordinary dose must usually be somewhat increased. The more powerful salines should ordinarily be avoided on account of their tendency to interfere with lactation.

Micturition. More or less difficulty in starting the flow of urine is complained of by many patients during the first two or three days after delivery. This is due to the laxity of the abdominal muscles which is present after labor and may cause considerable annoyance, although, aside from the discomfort which accompanies it, it produces no ill effects. If the retention is allowed to persist until the bladder becomes distended it may be a source of extreme discomfort and loss of rest to the patient. Catheterization, on the other hand, not only exposes the patient to the risk of a septic infection of the bladder, but if once begun must generally be continued for many days, while if the patient can be encouraged to empty her bladder for the first time herself, the difficulty is usually finally disposed of.

As soon as the desire for micturition arises the patient should be encouraged in every way to pass her urine herself. A hot compress should be applied over the suprapubic region, she should be allowed to hear the sound of running water, and, if necessary, should be aided in starting the flow of the urine by the application of suprapubic pressure from the hand of the nurse. If these simple expedients fail, many patients succeed in expelling their urine when they are turned upon the face or allowed to assume the knee-chest position. With tolerably strong patients these procedures, or even that of allowing them to sit up in bed to pass urine, are preferable to the use of the catheter, and are not attended by any particular risks.

Breasts. Disturbance or interruption of the action of the mammæ is, on the whole, the most common complication of the puerperium,

and they should always be carefully watched until lactation is fully established. At the first visit after delivery the breasts should be carefully examined by sight and touch, and the presence or absence of colostrum ascertained. The amount of breast tissue should be estimated and considered in connection with the constitution and physical condition of the mother, so that the physician may be enabled to form as accurate a judgment as possible of the patient's probable capacity as a wet-nurse.

If the nipples have not already been under observation, their condition should be noted. If any treatment of them is likely to be necessary, it should be begun at once before the establishment of the milk. In most cases the application of lanolin or some other emollient which was recommended for use during pregnancy to soften the nipples may be advantageously continued at this time. In primiparæ it is often advisable to make a systematic attempt to increase the prominence of the nipples from the time when the patient first recovers from the fatigues of labor. This may often be accomplished by instructing the patient or nurse to pull them forward with the fingers in imitation of the action of the baby's mouth, but it must be remembered that a too constant handling may produce irritation of them. If necessary they may be drawn out by the use of gentle suction of the breast pump or by means of a hot bottle. If the latter method is selected a six to eight-ounce bottle should be moderately heated by filling it with hot water. If the hot water is rapidly poured out and the bottle applied to the nipple quickly, the condensation of the contained air, which occurs during the cooling of the bottle, exerts a considerable force of suction upon the nipple and draws it out.

As soon as the initial period of rest is passed the patient should be directed to give the breasts to the child in alternation at intervals of six hours until the secretion of the milk is well established. This process causes reflex stimulation of the uterus and promotes its retraction. It distinctly hastens and increases the secretion of milk, affords an excellent opportunity of teaching the child to nurse properly, and supplies it in most cases with a certain amount of colostrum, which acts as an excellent cathartic and may assist the physician in warding off the administration by the nurse or family of castor oil, molasses and water, or other nostrums.

During the first forty-eight hours the child needs and should receive only what nourishment it is able to obtain from the mother's breast. If at the end of that time it becomes restless and seems unsatisfied, and the breasts are still unfilled, it may often be quieted and probably benefited by one or two teaspoonfuls of slightly sweetened milk and water, in the proportion of one part milk to three of water. This should be repeated at intervals of from two to three hours.

With the appearance of the milk the breasts increase rapidly in size, and often become so swollen as to be distinctly painful. If this disturbance occurs, it is usually promptly relieved by the application of a moderately firm breast bandage, such as is used in the treatment of threatened mammary abscesses, by massage of the breasts, and by the provocation of a moderate number of watery dejections with saline cathartics.

Until quite recently it has generally been taught that this establishment of the milk was ordinarily attended by the appearance of moderate pyrexia, which should not, however, exceed a temperature of 100.5° F. This so-called milk fever is, however, so seldom seen when exact antiseptic precautions have been employed, that it may be laid down as an accepted rule that unless the discomfort of the patient from distention of the breasts is decidedly excessive, any pyrexia which may appear at this period is probably due to a mild degree of septic absorption rather than to any process connected with the breasts.

As soon as any considerable quantity of milk appears in the breasts the baby should be nursed at two-hour intervals, being applied to one breast only at each feeding, and taking them in alternation.

Unless the condition of the child is distinctly poor, its interests as well as those of the mother are usually best served by nursing it only once between the hours of 10 P.M. and 6 A.M. The advantage to the baby lies in the fact that there is a greater probability that it will receive a satisfactory quality of milk, if the mother's rest is undisturbed than if she is kept awake the greater part of each night.

If, as is common at this stage of lactation, the milk flows spontaneously from the breast, the nipples must be kept covered by a light compress which will absorb it. This should be preferably made of linen, and should never be so thick as to promote maceration of the nipples by the production of an unnecessary amount of warmth. It should be an invariable rule of practice to require that the nipples should be washed thoroughly with a saturated solution of borax and water or boric acid before each nursing, and it is extremely important that the compress should be changed sufficiently often to prevent souring of the exuded milk. If this occurs, it is not only likely to disturb the digestion of the baby in the event of any carelessness in washing the nipples before nursing, but is also likely to originate a fermentation which by extension along the ducts may give rise to the formation of a mammary abscess.

Newborn children often fail in their first attempts at nursing, and in such cases dependence should be placed on gentle and frequent repetition of the trials rather than on a wearying persistence. The mother should be laid upon her side, supporting the baby's head

upon her upper arm in such a position that the nipple is exactly opposite its mouth and so near to it that it has no tendency to fall out. If the nipple is flat it should be drawn out by the fingers of the nurse or mother or by the use of a hot bottle before the child is applied to it. A few drops of milk should be pressed out of the ducts and allowed to remain on the nipple, so that the baby may get the taste of it. If these expedients fail a change of breasts may occasionally result in success. The child may sometimes be induced to nurse by gently stroking one of its mastoid processes while the nipple is in its mouth, it being a curious fact that the act of sucking is frequently induced within a few moments by this stimulation, whether the child is at the breast or not.

Should the nipple fall from its mouth it should be at once replaced by the mother, who must devote her whole attention to the process. The child should be allowed to nurse as long as it seems heartily interested in the effort, but as soon as it begins to mouthe the nipple, drops it repeatedly, or plays with it in any other way, it should be removed from the breast at once, for the reason that a longer continuance of nursing at such a time encourages a bad habit of dallying with the nipple, and not infrequently leads to the swallowing of air and consequent disturbances of digestion. Moreover, such actions are almost infallible evidence that its appetite has been satisfied.

Uterus. The uterus should be constantly examined from day to day to ascertain its consistency, tenderness, and size. During the first few hours after delivery the fundus is usually but a few inches above the symphysis, but by the end of twenty-four hours the retraction of the muscular fibres of the uterine ligaments usually raises the organ, so that the fundus is found at or nearly at the umbilicus. From this time on under normal circumstances there is a steady decrease in its size and a steady increase in its consistency, until on or about the tenth day the fundus can no longer be felt with ease through the abdominal walls, and is at last wholly below the level of the symphysis pubis.

The progress of the process of involution should be observed from day to day, because subinvolution or the delay in the return of the genital organs to their natural state is a complication which may be sufficient to indicate considerable alteration in the management of the convalescence. Under normal circumstances the uterus is a tender organ, and one which is rather unpleasantly sensitive to the touch during the first few days after delivery, but unless some inflammatory process is present gentle handling does not cause severe pain.

Lochia. The character of the lochia should be inquired about or ascertained by the inspection of the vulvar pad at each visit, the points to be noticed being the color, amount, and odor. During

the first three or four days the lochia should have a red color and be sufficient in amount to soak the pad more or less thoroughly in from six to eight hours.

After the fourth or fifth day the discharge is faintly pinkish and much decreased in quantity, and by the end of ten days it should be scanty, of a grayish-white or yellow color, and of a creamy consistency.

Unduly long persistence of the red color may be due to the existence of small vaginal or cervical tears, or to pelvic congestion.

The reappearance of the red color after it has once been lost suggests the presence of a foreign body in the uterus—*e. g.*, clots or portions of the placenta or membranes, subinvolution, or some malposition.

A sudden decrease in the quantity or total disappearance of the lochia suggests, according to the concomitant symptoms, either septic infection or an occlusion of the internal os by retained clots or other substances. Normal lochia has a peculiar, sickish odor, which should be made familiar to the nostrils by constant examinations of the pads in normal cases. The appearance of a distinctly foul smell or odor of decomposition is always strong evidence of beginning sepsis. A slightly stale odor may precede the appearance of foulness, and should lead to a careful investigation of its cause. If the nurse is inefficient, it may not infrequently be due to partial decomposition of the lochia upon the outside of the vulva or on the thighs, clothing, or bedding of the patient. The matter is, however, of so much importance that the physician should always personally investigate any such suspicious symptom. When the lochia are suppressed and infection can be excluded, hot cloths or poultices should be applied to the lower portion of the abdomen, and ergot should be given in the hope of stimulating the uterus into contraction and forcing it to expel the plug.

Visits. The number of visits which the physician should make during a normal convalescence is a matter upon which some differences of opinion obtains, but the majority of obstetricians agree that constant attendance during the first week is of the utmost advantage in forestalling and preventing the accidents and complications to which patients are liable at this period. It is the best plan to see every patient at the end of from eight to twelve hours after labor, and thereafter once daily until the establishment of the milk begins. She should then be seen once or twice in each day, as the necessities of the case may make advisable, until the flow of milk is well established. After this time, in normal cases, a visit every second or third day is all that is necessary, and with a good nurse the intervals may be made much longer.

Length of the Puerperium. The puerperium lasts until the involution of the uterus and adnexa is thoroughly completed, a

process which usually consumes a full six weeks. During the first half of this time any long continuance of the upright position imposes an undue strain on the uterine supports, since an unusually heavy uterus must be held in position by partly involuted and, therefore, somewhat lax and softened ligaments. This danger, however, decreases with the process of involution, and an unduly long confinement to bed is distinctly productive of fatigue, discomfort, and loss of vigor. This is partly due, no doubt, to the mental weariness arising from the tedium and irksomeness of remaining in bed, and partly to the loss of strength due to muscular inaction. It is, moreover, a fact that a somewhat scanty secretion of milk often increases when the patient is allowed to get up. For these reasons no absolute rule can be laid down as to the precise length of time that must be spent in bed, but the period must vary in accordance with the physical condition of the patient and the necessities imposed on her by her social status.

The best average rule in practice is as follows: Among the poorer classes the patient should be kept in bed, or at least restrained from her ordinary work, for as nearly two weeks as possible. This is all that can usually be accomplished among working women. Among the better classes women of superior physique should be kept flat in bed until about the twelfth day, when, if the fundus of the uterus is no longer palpable above the pubes, they may be allowed to assume a sitting position in bed, preferably during one meal. If no considerable fatigue, dizziness, or backache follows this effort, it may be repeated two or three times on the following day. The patient is then allowed to move herself from the bed to a lounge placed close beside it, and is then rolled away to another part of the room while the bed is turned and aired. She should not be permitted, however, to sit up for more than fifteen minutes at a time, and should be encouraged to maintain as nearly a horizontal position as is comfortable during the remainder of the day. If no ill results follow this indulgence, she is permitted to sit up for short periods with increasing frequency, and at the end of three weeks may be allowed to walk from the bed to the lounge.

During the fourth week she is given the freedom of her room, and during the fifth week may go down to one or more meals daily. She should remain in the house for another week, and may then resume her ordinary duties. If, however, circumstances make an earlier release desirable, there is no risk in the majority of cases in permitting a somewhat greater freedom during the last three weeks.

If involution is tardy, or the general condition of the patient is poor, a much longer confinement to bed may be advisable or necessary. The golden rule is that every increase in freedom should be gradual.

The erect position should be assumed several times daily for periods of a few minutes rather than once for a longer time. Every fresh indulgence should be adopted tentatively and stopped at the first sign of backache or fatigue.

Cases thus treated are undoubtedly less liable to subsequent gynecological disorders and are better fitted to endure the fatigues of prolonged nursing than are those who are encouraged to a more hasty resumption of the ordinary course of life; but, though this is a conservative general rule, it must be repeated that great variations are permissible, and many cases may safely get about much earlier.

CHAPTER XXVIII.

THE NEWBORN CHILD.

THE care of newborn infants in ordinary health falls necessarily within the province of the obstetrician, but it is by no means within the scope of a text-book on obstetrics to deal with the management of the diseases of infancy and childhood. For this reason this chapter will be limited strictly to the care of normal infants and to those minor ailments which are likely to arise during the period when the mother still demands the attention of the physician—*i. e.*, during the first six weeks of the infant's life.

Baths. The baby should be bathed once daily in warm water, but the bath should not be given immediately after nursing. Until the cord has separated the baby should be sponged rather than placed in the water, since any moistening of the cord would interfere with its desiccation. The proper temperature for the bath is about 98° F.

Care of the Funis. If the cord was originally dressed aseptically and is afterward kept dry as long as it adheres, it ordinarily separates as a dry eschar without suppuration. If, however, infection occurs from any cause, and the cord separates by suppuration, leaving a moist ulcerated surface, this should be washed with a mild antiseptic such as boric acid, and a dry sterilized dressing applied. If this dressing is undisturbed, a dry scab usually forms, which subsequently separates without trouble.

If the cord has been improperly cared for, septic absorption may occasionally occur. In such a case the treatment should be sterilization and the application of an iodoform or boric-acid dressing. Care must be used, however, in the employment of antiseptics on newborn infants, on account of their feeble vitality and their greater liability to poisoning by absorption of the antiseptics.

Such a child should, moreover, be given from one to three drops of whiskey before each nursing, and every care should be taken to ensure its procuring a proper amount of food To this end the intervals of nursing should be shortened if necessary and the child kept at the breast as long as it can be persuaded to suck.

Clothing. The clothing of the infant should be loosely applied. The tight bandaging which some nurses affect not only does harm by restraining the movements of the chest, but also tends to produce an injurious intra-abdominal pressure, which is not unlikely

to result in the production of an umbilical or inguinal hernia, instead of preventing it as it is intended to do.

Retention of Urine and Feces. Mothers and nurses are frequently much alarmed at the supposed non-appearance of urine or feces during the first few hours or days of the child's life. If the non-appearance of feces has been definitely ascertained it should always lead to an examination of the anus and rectum, in view of the possibility of an imperforate condition of the gut. Closure of the urethra is so extremely rare that true retention of the urine is seldom seen, the fact being that the newborn infant passes but little urine, and has usually emptied its bladder during the process of birth. Therefore, if the child seems well, and the external meatus is properly formed, the family may be confidently assured that the temporary absence of urine is of no importance.

Icterus Neonatorum. Jaundice of the newborn infant is occasionally dependent upon structural lesions of the liver. It is then extremely intense, is associated with rapid emaciation, and presents the appearance of a serious disease even to inexperienced eyes. The prognosis in this form of jaundice is uniformly bad, but such cases are extremely rare. On the other hand, the minor degrees of icterus are quite frequent among poorly nourished infants, and especially among children of the ill-fed immigrant population of our cities. This common affection is usually associated with a slight loss of weight, but is always temporary and of no importance, and demands no treatment.

Weight of the Child. During the first three to five days of its independent life the child receives and absorbs but little nourishment. It usually loses several ounces of its birth-weight during its first few hours by excretion of urine and feces, and also probably undergoes a somewhat rapid metabolism during the process of adaptation to its new condition. The result is an almost universal initial loss of from three to ten ounces, large babies losing more in proportion than those whose initial weight is less. By the end of from five to ten days the child should normally regain its birth-weight, and, if well, should gain steadily from that time. This is so definite a rule that a failure to gain, or, more especially, a loss in weight is significant at any period of infancy of improper nutrition or of the existence of functional or organic derangements.

Nothing is more important in the routine care of infancy than the daily weighing of the child. This should be done as nearly as possible at the same hour of the day, the most convenient time being immediately after the bath, while the child is still naked. Even then some variation may occur as the result of a difference in the amount of food ingested or in the amount of urine and feces excreted from day to day.

The scales should register the ounces, and, if the circumstances of the parents permit, it is well to purchase a spring-dial scale, such as that sold under the name of the "Standard Family Scale," to be devoted entirely to this purpose. The process of weighing may be much facilitated by lashing to the top of the scale a shallow basket in which the baby can be placed. The daily weight, which during the first few months should show an average gain of an ounce a day, should be recorded by the nurse upon a chart or piece of paper, and kept for the inspection of the physician beside the mother's temperature chart.

Digestive System. SPRUE. A frequent source of alarm to the mother and family is the appearance of white aphthous patches upon the infant's tongue and mouth. These patches are popularly known under the names of "thrush" and "sprue," and are in reality a low form of vegetable life which develops upon the buccal surfaces as the result of a fermentation which is the result of the use of a dirty bottle, fermented milk, or other improper foods. The prophylaxis of the affection is evident. When it occurs it may usually be removed in a few days by scrubbing the inside of the mouth with a saturated solution of borax. The nurse should wrap a piece of soft linen tightly around her forefinger, should dip this in the solution, and should carefully rub it over the whole of the affected surface immediately after each feeding. Absolute cleanliness of the nipples, etc., must be observed.

REGURGITATION. Infants which are being properly fed should regurgitate but little if any milk. Should this regurgitation be frequent or abundant it is usually dependent either upon fermentation of the milk within the stomach or on too frequent or too abundant feeding. It may also be dependent upon undue richness or other improper composition of the milk. If it is due to the first cause, it may usually be remedied by careful cleaning of the nipples and mouth. If it is caused by unduly rich milk, it should be treated by increasing the dilution of the milk in bottle-fed babies or by the administration to nursing infants of one or two teaspoonfuls of water just before putting them to the breast.

BOWELS. For the first few days of life the child's dejections consist of dark, brownish-green, tarry-like meconium, and then gradually assume the light yellow color which is characteristic of the feces of healthy infants. The bowels should move at least once daily, but the appearance of several dejections within twenty-four hours is of no importance, provided that the color and consistency remain normal. Frequency, in connection with a green color and watery consistency, is usually an indication that the food is in some way unsuited to the digestion.

CONSTIPATION. Constipation should be treated by an alteration of the food if any impropriety can be detected in it. In bottle-fed

babies this can be done by an increase in the proportion of the fats and a decrease in the amount of proteids in the milk. In breast-fed babies the constipation must be relieved by methods analogous to those used in adults.

The rectum of the infant is so small that if injections are used they must be limited in quantity to one-half ounce of soapsuds and water at most. A better method is the introduction within the anus of a plug of pure castile soap of about the size and shape of a large bean. This is almost invariably efficient, and is not productive of discomfort, but if frequently repeated is liable to cause some slight irritation of the anus, and should then be replaced by a piece of molasses candy of similar size and shape. The bowels may also usually be moved by the administration by the mouth of a couple of drachms of sweet oil or by one of the following prescriptions: Phillips' milk of magnesia, sig. teaspoonful when needed; or, ol. morrhuæ, 4 ounces; aq. calcis, syr. calcis lacto-phos., 2 ounces each, sig. one-half teaspoonful, t. i. d. Castor oil and similar cathartics should never be used.

DIARRHŒA. The amount and frequency of the dejections is of small importance during the first weeks of infancy, but when the character of the excreta changes from the normal color and consistency, and either assumes a greenish color or is filled with flecks of coagulated and undigested milk, it may be taken for granted that the food of the infant is unsuited to its needs. If the baby is breast-fed an analysis of the milk may disclose a deficiency in some one of its constituents, which may usually be remedied by an alteration of the diet or hygiene of the mother, or an excessive richness which may be compensated by giving the baby a little water before each nursing. Bottle-fed infants may be treated by similar alterations of their food. The diarrhœa of infants is, however, so extensive a subject, and forms so large and important a part of all text-books on the diseases of children, that its further consideration will be omitted here.

Nursing. During the first thirty-six hours after birth the newborn infant requires little or no nourishment, and if put to the breast at intervals of six hours will usually be satisfied with the small amount of colostrum which it obtains. This not only satisfies the infant and enables the physician to prevent the administration of catnip tea, sugar and water, and other nostrums, but also draws out and prepares the nipple for its subsequent duties, stimulates the involution of the uterus, and has a distinct tendency to hasten the secretion of the milk. It should be continued until the milk appears in full force.

After the secretion is established the infant should be given the breast regularly every two hours during the daytime for the first six or eight weeks, and after that at intervals of three hours. Feeble

children must be nursed at least twice at night, but vigorous infants should be taught from the start, in the interests of the mother as well as in their own, to be content with but one nursing between ten at night and six in the morning, and after the first four or six weeks even this should be omitted.

If the milk makes its appearance late, the child should be fed occasionally, after the second day, with one or two teaspoonfuls of a mixture of cow's milk and water. This should be mixed in the proportion of one part milk to three parts of water, warmed and slightly sweetened, preferably with milk sugar.

In determining the period at which this preliminary feeding becomes necessary no invariable rule should be employed, but the physician should be guided by the behavior of the child. Infants which sleep soundly and do not cry should not be disturbed for the administration of unnecessary nourishment, but as soon as the baby becomes restless, is indisposed to sleep, and cries frequently, it should be soothed in the manner just described. Many babies refuse to take the breast at first, and considerable patience is often necessary in teaching them to nurse. The mother should be made to assume a position in which she can comfortably support the head of the infant upon her arm in such a way that its mouth is directly opposite the nipple. It should then be held so near the breast that the nipple has no tendency to fall from its mouth, but care must be taken that its nostrils are not in contact with the mother's skin, since no child can nurse successfully unless it is able to breathe freely through its nose. If the nipples are flat they must be drawn out by the fingers or by a hot bottle just before the child is applied to them, and if the milk does not flow freely, it should be brought to the surface of the nipple by stroking the breast with the fingers. Patience, perseverance, and attention to details are essential to success in many cases.

If the secretion of the milk is still deficient or unsatisfactory at the end of the second week, it may usually be considered as an established fact that the mother will prove to be incapable of nursing her child. In such a case the alternatives of artificial feeding and the employment of a wet-nurse present themselves. If the child is possessed of ordinary vigor, the problem should ordinarily be decided in favor of artificial feeding, which at the present day has reached a high degree of perfection, but very delicate children sometimes have a better chance if given to a wet-nurse.

Selection and Care of Wet-nurses. The important points in the selection of a wet-nurse are: That she should be free from phthisis, syphilis, and other constitutional or hereditary diseases; that she should be in good general health and possessed of breasts which yield an abundant supply of good milk. Her baby should preferably be about the same age as the foster child. It is a point of

considerable practical importance to make sure that the character of the woman and her temper are such as to permit of her forming a tolerable inmate of a respectable household.

The size of the breast is of less importance than the freedom with which the milk flows and the quantity which can be obtained from a single emptying of the breast. Small breasts with an abundance of glandular tissue are often the best organs.

The woman should be carefully questioned as to her family and personal medical history, and her skin, mouth, and throat, should be examined for evidences of syphilis. The physician who attended her during labor should, if possible, be questioned on the same points. The breasts and nipples should be carefully examined, and she should be asked how recently she has nursed her baby. An applicant for such a position is particularly liable to state that her breasts have just been exhausted by her own baby. As this may or may not be the case, the physician should not accept her until he has seen the breasts in good condition, but should direct her to come again when she has been at least two hours without nursing. No wet-nurse should ever be engaged without an inspection of her baby, since its condition and the record of its weight furnish the most valuable evidence obtainable of the quantity and quality of her milk, and because syphilis, which has escaped detection in the mother, may be unmistakably present in the child. If possible some milk should be drawn from the breast and submitted to an expert for chemical analysis.

No wet-nurse should be allowed to keep her child in the house with her during her engagement, since it is practically certain that in such a case her own child will receive the lion's share of her breast milk. It is, moreover, almost invariably necessary that some member of the family should supervise her nursing of the foster infant, at least during the early part of her residence, both to prevent neglect and to ensure a faithful observance of the rules of regularity and cleanliness on which the health of the infant is greatly dependent.

Artificial Feeding. If it is decided not to employ a wet-nurse, and the mother's milk has failed, the baby must be brought up on the bottle. A plain three or four-ounce bottle should be selected and furnished with a small nipple of black rubber. The hole in the end of the nipple should be neither so large that the baby obtains more milk than it can conveniently swallow, nor so small that it has to work unduly hard. The patent nursing bottles furnished with a nipple attached to the bottle by a piece of rubber tubing are abominations which should never be used, and which invariably result in the production of digestive disturbances from the fact that it is impossible to keep such a tube properly cleaned.

The use of a simple nipple makes it necessary that someone should hold the bottle while the baby feeds, but this is by no means a disadvantage, since it is highly important that the baby should be forced to take its whole allowance of food at one sitting, and should not be allowed to doze over its meal and to feed by instalments with insufficient intervals. Care should be taken to remove the nipple from the mouth and hold the bottle in the vertical position for a few seconds at intervals of two or three minutes, in order to permit the entrance of sufficient air to replace the milk which has been ingested. Neglect of this precaution results in the failure of the baby to obtain milk without unnecessarily fatiguing exertion. The amount of milk given at each nursing should be regulated by the size of the child, the best rule being that babies of average size require during the first week one ounce of milk at each feeding, and two ounces at the end of six weeks, which amounts should be slightly increased or diminished for unusually large or small infants. After use the bottle should be rinsed first with cool and then with scalding water, and should be further cleansed by shaking within it a quantity of rice suspended in water. It should then be rinsed out again and filled with clean water, to which a little cooking soda has been added. The nipple should be thoroughly rinsed with cool water and then with boiling water, and kept at the bottom of a glass filled with a weak solution of bicarbonate of soda.

The only proper substitute for woman's milk is cow's milk, but the chemical composition of the two is very different, and cow's milk must be artificially modified to make it proper food for a young infant.

The chemical analysis of woman's milk shows that in the average milk the principal constituents are present in the following proportions: fats, 3.50 to 4.50 per cent.; sugar, 6 to 7 per cent.; proteids, 1.25 to 2 per cent. The milk is, moreover, slightly alkaline in reaction.

Average cow's milk, on the other hand, contains the following proportions of the principal constituents: fats, 4 per cent.; sugar, 4.50 per cent.; proteids, 4 per cent., and is slightly acid.

The problem at once arises, "How can cow's milk be approximated to human milk so as to form a proper food for a young infant?"

A glance at the tables given above shows at once that cow's milk contains practically the same amount of fat as human milk, a much lower percentage of sugar, and a much higher percentage of proteids. It is, moreover, acid while human milk is alkaline in reaction. An excess of the proteid constituents of the milk is what ordinarily causes disturbance of the infant's digestion, while a considerable amount of sugar is necessary for its proper nutrition. If there is a milk laboratory at hand, milk modified to the proper proportions

can be readily obtained on prescription. Just as good results can be obtained, however, by home modification of the milk, and the modification is, perhaps, more trustworthy than that furnished by a commercial enterprise.

The details are simple and can be carried out from written directions by any moderately intelligent person. The mixed milk of a herd should be preferred to that of one cow, as it is less likely to be affected by any change in the health or diet of the animal.

The formula given here is based on a total mixture of twenty ounces for use in the twenty-four hours, and may be changed as desired in the given case. One quart of milk should be placed in a glass jar and allowed to stand in a cool place for six hours, when the upper one-fourth should be poured or siphoned off and used as the basis for modification. Analysis has shown that in average top milk the constituents are present in the following proportions:

Fat, 10 per cent.; sugar, 4.50 per cent.; proteids, 4 per cent. Taking twenty ounces as the total amount to be prepared for the day, and 4 per cent., 7 per cent., 1.50 per cent., as a fairly average milk to be approximated, the formula is as follows: The upper one-fourth of the quart of milk, or eight ounces, contains 10 per cent. of fat. Therefore, eight ounces of the top milk added to twelve ounces of water gives a mixture containing 4 per cent. of fat, or the proper amount, while the percentage of the other ingredients is altered. The amount of sugar in the top milk is 4.50 per cent., and in the twenty-ounce mixture is only 1.8 per cent., or much too low. This deficiency should be made up by the addition of two level tablespoonfuls of milk sugar, which raises the amount of sugar in the mixture to approximately 7 per cent.

The proteids, on the other hand, are reduced to about 1.6 per cent., which is within the normal limits for the digestion of a healthy child.

It must not be forgotten that cow's milk is acid and human milk is alkaline. For this reason enough lime water, approximately 5 per cent., should be included in the mixture to make it mildly alkaline. The formula as a whole is then: top milk, eight ounces; water, eleven ounces; lime water, one ounce; milk sugar, two tablespoonfuls. This mixture may be changed easily in either amount or strength as may be desired, and is certainly very satisfactory for general use.

The difficulty of obtaining fresh milk during the heat of summer in city practice leads some authorities to recommend the use of condensed milk under those circumstances, but if this is employed the greatest care is necessary to keep it from spoiling. It should be used in the proportion of one part of condensed milk to nine of water.

Sterilization. Whichever food is used may be rendered far less liable to disturb the infant, especially during hot weather, by sterilization, or pasteurization at 167° F. If this is to be done the patient should procure twelve bottles, and each morning the bottles should be sterilized, and then filled, each with the amount of milk to be given at one feeding, with the exception that the lime water is only to be added just before the milk is used. The bottles should be stoppered with absorbent cotton and placed in a kitchen steamer, or in a special sterilizing apparatus such as Arnold's steam cooker. The milk should be subjected to the action of the hot steam for about twenty minutes, and then set aside in a cool place. When the child is to be fed, one bottle is warmed by immersion in hot water for a few minutes, the cork is removed, the lime water is added, and the nipple drawn over the neck of the bottle, which is then ready for use. Except in hot weather, when there is doubt as to whether the milk will keep or not, sterilization is unnecessary, and prolonged feeding of infants on sterilized milk seems to have a distinct tendency to result in the development of rickets and scurvy. Infants with very feeble digestion are often much aided by partial pre-digestion of the milk. This may be done by the use of Fairchild's peptonizing tubes, which should be used in accordance with the printed directions which accompany them. When the mixture is sufficiently peptonized it should be kept on ice until it is needed, in order to prevent further digestion. No food except milk should be given to an infant during the first three months of its existence at least.

Passage of Drugs Through the Milk. No rule has as yet been established by which it can be judged with any certainty whether a given drug will affect the baby by passing through the mother's milk. Some few drugs are known to diffuse themselves readily in this way, and of others it is known that they seldom or never pass. The remainder are uncertain, and their diffusion, or not, is probably largely dependent upon the idiosyncrasies of the individual woman. Salicylic acid, iodine, potassium, and atropia usually affect the baby when given to the mother; while mercury, the mineral acids, opium, and chloral, seldom or never can be detected in the milk.

Dermatitis Neonatorum. The skin of the newborn infant has been, during its whole intra-uterine life, immersed in water and protected from maceration by its covering of greasy vernix. The abrupt change to the external air not infrequently causes a mild exfoliative dermatitis, which may be the cause of much alarm to the mother and family. It passes off spontaneously in a few days if untreated.

Mastitis Neonatorum. Many infants soon after birth develop a parenchymatous mastitis, which oddly enough is more common among boys than girls. The swelling is sometimes considerable,

the breasts are tender, and may occasionally contain a milky substance. If not irritated by attempts to express milk or reduce the swelling by friction, they tend to disappear spontaneously, but when so irritated they may result in severe mastitis, or even in abscess formation with destruction of the gland. If the breast is red and hot, poultices should be applied. If suppuration takes place the abscess should be incised at a distance from the nipples.

Ophthalmia Neonatorum. The conjunctivæ of newborn infants are extremely prone to mild degrees of inflammation, which may be excited by sudden exposures to bright light or to contact with foreign substances—*e. g.*, soap. These mild attacks may, from want of proper care, be converted into serious ophthalmias. The most common cause of conjunctivitis is, however, infection of the conjunctivæ with the gonococcus at or about the time of birth. This is not only the most common, but also the most dangerous infection, and it is a routine practice in many lying-in hospitals to drop into the eyes one or two drops of a 2 to 4 per cent. solution of protargol, as a prophylactic measure, as soon as the baby is born. This method has resulted in a marked diminution of the purulent ophthalmias in institution work, but has led to a considerable increase in the milder catarrhal forms due to chemical irritation. In private practice it is probably best to limit this precaution to cases in which the physician detects a purulent leucorrhœa during labor, or has reason to suspect the probable existence of a fairly recent gonorrhœa in one or the other parent.

Slight catarrhal conjunctivitis with serous secretion is usually readily relieved by keeping the infant in a dark room with constantly renewed, cold, moist compresses on the eyes. These should consist of small squares of linen folded once, and changed at frequent intervals. At the same time, a few drops of the following eye-wash should be placed upon the conjunctivæ every two or three hours: sod. borat., 10 grains; aq. camphoræ, 1 ounce; sig. collyrium, as directed.

When the inflammation is so severe that the lids become swollen, and when the secretion is in the least purulent, stronger measures must be used. The most important thing in treatment is that the eyes must be kept washed clean. The lids must be separated at intervals of fifteen minutes, and the purulent secretion washed out with a solution of boric acid (2 to 4 per cent.). In addition one or two drops of protargol (2 to 10 per cent.) should be placed on the conjunctivæ once in every twenty-four hours in the mild cases, and every six hours in the severe cases. When improvement appears the solution of borax in camphor water given above should be used instead of the protargol every three hours.

Umbilical Vegetations. These growths may be sessile or pedunculated. They may vary in appearance from a soft jelly-like body

to the more common form of a hard semifibrous protuberance. In size they may be as large as a hickory-nut. They are not painful and seldom bleed. When pedunculated they may be readily removed by ligaturing the pedicle, after which the growth may either be snipped off with scissors, or may be left to separate by necrosis after the arrest of circulation. In the sessile varieties it may occasionally be necessary to preface the ligature by the passage of one or more needles through the base of the growth. These tumors do not tend to recur, and their appearance is not a serious matter.

Umbilical Hemorrhage. Hæmatophilia. Hemorrhage from the umbilicus may occur independently of hæmatophilia as the result

FIG. 240.

Double cephalhæmatoma. (DAVIS.)

of a mechanical injury, such as forcible separation of the cord. In these cases it is readily arrested by compression or by the application of styptics. If styptics are used great care must be taken to avoid irritation of the tender skin in the neighborhood of the navel. Hæmatophilia, which is the more common cause of these hemorrhages, is supposed to be the result of an infection at the base of the cord in most cases, although the inherited form of hæmatophilia, which is due to some disease of the blood or bloodvessels, sometimes causes trouble at this time. The two conditions are identical in their symptoms and results, but their etiology and pathology are widely different. In these conditions hemorrhage may take place from the umbilicus, under the skin, and from any of the mucous surfaces. In severe cases the whole body may be covered with

petechiæ. An attempt should be made to control any external hemorrhage by pressure or styptics, though these will often fail. When the disease is general the prognosis is extremely grave, and no specific treatment is worthy of much confidence, but every care should be taken to preserve the patient's strength, as the disease is self-limited, usually reaching its height in five or six days.

Cephalhæmatomata. These tumors are formed by the effusion of blood between the skull and scalp, and are probably due to the rupture of small bloodvessels by excessive overlapping of the cranial bones during the process of birth. The tumor yields on examination an indistinct sense of fluctuation. If no treatment is adopted suppuration never takes place, but the effused blood is gradually absorbed and disappears. In this process a perceptible ring of bone is deposited around the edge of the extravasation. This ring of bone gradually spreads inward as the tumor disappears, and results in the formation of a slightly thickened spot upon the skull, which may be perceptible on close examination for many years. These tumors are not perceptible at birth, but appear within the first few hours of extra-uterine life and last about a month.

Malformations of the Heart. Malformations of the heart or of the great vessels may be due to their imperfect development or to the persistence after birth of normal fœtal conditions. Early arrest of the development of these important organs is seldom compatible with life. The only forms of late arrest of development which are sufficiently common to be worthy of notice are deficient development of the interventricular or interauricular septa, and of failure to close on the part of either the ductus arteriosus or the foramen ovale during the first few days of life. These malformations result in the persistence of the fœtal condition of circulation. Their causation is obscure.

Symptoms. The most striking and invariable of the symptoms of an imperfect circulatory system is cyanosis. The importance of this phenomenon is dependent upon its permanency. Transient cyanosis may be the result of asphyxia neonatorum, and, aside from this, is common in otherwise healthy children during the first twenty-four or forty-eight hours after birth. It is most marked in the hands and feet, is probably due to a partial persistence of the fœtal circulation, and disappears spontaneously. The affected parts are cold to the touch, and should be kept warmly wrapped. No other treatment is needed. Persistent blueness is almost invariably the result of some cardiac malformation. The transient form usually appears within a few minutes or hours of birth. Cyanosis, which is dependent upon organic lesions, appears in the majority of cases during the first week and usually within the first twenty-four hours. In a large minority of cases, however, it may be absent until some weeks or even years of normal life have supervened, and is then

usually first noticed after some severe effort or in some debilitated condition. Such cyanosis is liable to an occasional paroxysmal increase, and is accompanied by an increased radiation of heat, a tendency to dyspnœa, palpitation, and occasionally hæmatophilia. Such individuals usually maintain a somewhat feeble existence until attacked by some intercurrent disease, but they are likely to succumb to extremely mild attacks.

TREATMENT. The treatment of these cases is mainly hygienic. The clothing must be warm, and all exposure to draughts or other forms of cold must be carefully avoided. All excitements must be absolutely forbidden, and the diet must be watched with the greatest care. The only medicinal treatment which is of value is the moderate use of alcoholic stimulants and the occasional administration of digitalis.

During the paroxysms of dyspnœa hot mustard footbaths and the administration of oxygen should be tried.

Malformations of the Lungs. Deficient development of the lungs or of the lesser branches of the pulmonary arteries may result in deficient oxygenation of the blood and feeble health. An antemortem diagnosis is rarely possible. Some few cases have been reported in which a structural defect of the diaphragm gives rise after a few good respirations to a diaphragmatic hernia of the lungs into the abdominal cavity, with failure of respiration, and death.

Atelectasis Neonatorum. Closely akin to non-development of the lungs is the atelectasis of the newborn. This condition may be due to the plugging of important bronchi with inspired mucus, or to failure of the child to fully inflate its lungs after delivery. The result is the same whatever the cause, non-expansion of a portion of the lung. It is to be prevented by thorough removal of all mucus from the fauces with the little finger as soon as the child is born, before inspiration has occurred, and by care to make the child cry loudly immediately after its birth. When atelectasis has occurred, its presence is indicated by dulness and by absence of the respiratory murmurs over the affected portion of the lungs. It is to be treated by stimulating respiration by any of the methods recommended for use in asphyxia neonatorum, life being temporarily supported by the use of oxygen if necessary. If other methods fail, inflation of the unexpanded portion of the lung through a catheter passed into the trachea is usually efficient.

Supernumerary Digits. Extra fingers and toes are fairly common abnormalities. Such digits may be attached to special supernumerary metacarpal or metatarsal bones, or by skin only. When extra metacarpal or metatarsal bones are present they should be removed with the finger or toe by a set amputation. When the abnormal member is attached by skin and connective tissue only, it

may be snipped off with scissors, or allowed to separate by necrosis after ligature of its pedicle. In either case the amputation should be performed within a few weeks after birth, since it is less likely to leave a permanent scar at this time than if deferred to a later period.

Cleft Palate and Harelip. These abnormalities are due to failure of development. They are unimportant as far as the health of the infant is concerned, unless the deformity is sufficient to interfere with nursing. Harelip should be operated on at some time during the early months of life, and cleft palate at a later period.

CHAPTER XXIX.

CARE OF PREMATURE INFANTS.

Prognosis. Children born before the end of the twenty-ninth week of gestation seldom survive. It is possible, however, that the almost uniform loss of life at periods only slightly earlier than this may, to some extent, be due to a greater or less want of proper care, which is induced by the fixed belief in the impossibility of the survival of these children. For this reason, therefore, it should be a fixed rule that any child which breathes at birth should be treated as if there were a good chance of its survival. The chances for the life of the individual child depend mainly upon the degree of development of its internal organs, and since this is more dependent upon the period of uterogestation than upon the size or weight of the infant, its chances of survival vary more in accordance with the period of its birth than with any other circumstance.

There is a wide-spread belief among the laity, from which the profession is not entirely free, that eight months' children have a decidedly poorer chance of survival than seven months' children. This is utterly false, if the same treatment is accorded to both classes of children.

It is a fact, however, that an eight months' child differs only in size and vitality from a full-term infant, and, therefore, is likely to be treated as such with disastrous results; while the evident immaturity of the seven months' infant usually results in its receiving the care and attention which are necessary to preserve its life.

If, however, it is borne in on the attendants that the life of a fairly well-nourished and approximately mature-looking infant of eight months is as much dependent upon scrupulous and painstaking care as is that of a feeble fœtus born four weeks earlier, and requires the same minute attention, the proportion of survivals will be greater the longer the gestation has lasted.

Death. Premature children are much more liable to die suddenly than are children born at term. The infant in many cases seems to be doing perfectly well, is taking its food well, and apparently gaining, when suddenly a convulsion appears without the slightest warning, and death follows rapidly. In other cases a progressive asthenia develops, evidenced by restlessness, refusal to swallow, and the production of a peculiar intermittent moan with each inspiration, and the life fades out quietly. If the life of a prema-

ture infant is preserved until the natural time of full term arrives and until an increase in its weight and strength appears, its chances of prolonged life are, in most cases, inferior in no way to those of infants born at full term.

Care. The three essentials in the care of all premature infants are: careful maintenance of the body heat; reduction to a minimum of the exhaustion caused by passive motions—*i. e.*, handling, bathing, etc.; and nourishment by small quantities of proper food given at short intervals. The details which are necessary to the attainment of these objects are, however, so numerous that few premature children survive, unless they have the advantage of the care of an intelligent nurse who is devoted to them alone and has no other duties. For this reason an effort to secure such a person should be the first and most essential step in treatment. When such a nurse is provided, she should be impressed with the fact that, although the chances of the child improve with every day of its survival, it is not out of danger until it has reached the full age of nine months from conception, nor even then unless it begins to show a substantial gain in weight and strength. It should also be explained that any indiscretion, no matter how slight, is liable to result not only in the illness, but in the death of a child which up to that time has done perfectly well.

Seven Months' Children. Babies which have reached a period in intra-uterine life of less than eight months must be kept under conditions as nearly approximating that state as possible. They should neither be washed nor dressed, and should never be subjected to the fatigues of nursing. If such an infant is asphyxiated at birth the main reliance for its resuscitation must be immersion in hot water, with the least possible use of the cold plunge. If possible, the use of cold water should be avoided altogether, since the abstraction of heat by this means is always a serious matter, and may prove fatal from the shock produced. Artificial respiration is also to be avoided whenever possible, since the amount of handling which it involves is necessarily attended by a degree of exhaustion which may prove fatal to, or at least seriously compromise, the chances of the child. As soon as respiration has been established the infant should be wrapped at once in well-warmed flannels or cotton-batting, and the further arrangements for the preservation of heat which are to be described shortly should be inaugurated at once.

Eight Months' Children. Children which have reached the age of eight months may, if they are fairly well developed and vigorous, be rapidly washed in warm water with the least possible amount of handling, loosely and quickly dressed, and at once placed under the proper conditions for the preservation of their body heat.

Seven months' children must be artificially fed, preferably with the mother's milk, for many weeks or until the gain of strength is

so far apparent that the muscular exertion of nursing is, in the opinion of the physician, within their powers. Eight months' children if vigorous may be put to the breast as soon as the milk appears, but if the act of nursing apparently exhausts them, or if after a fair trial they either lose or fail to gain weight, it may fairly be assumed that the exertion of nursing is productive of too great exhaustion, and it should be stopped at once, and the child fed artificially. All premature infants must begin to receive nourishment within a few hours after birth, since their vitality is relatively so slight that it is not safe to wait for the establishment of the milk before feeding them. The food must be given in small amounts on account of the relatively small capacity of the stomach, and for this reason the intervals between feedings must be made short, in order that the infant may receive the necessary amount of nourishment.

MAINTENANCE OF BODY HEAT. It is of the utmost importance in the treatment of premature infants that the loss of body heat should be reduced to a minimum, and as nothing tends more to reduce their vitality than exposure to the constant variations of temperature which take place in the ordinary room, some means must be provided to procure for them a constant supply of fresh air which has been warmed to a constant and somewhat elevated temperature before it reaches the infant.

In the absence of better facilities the lives of many premature infants may be saved by a careful supervision of such simple preparations as may be made in any household. A large basket should be thickly lined with heated blankets or other flannels. A number of bottles filled with very hot water should then be so arranged around the sides of the basket that they can be removed in order to be refilled, and reinserted without disturbing the infant. The child should be wholly covered, with the exception of its face, with well-warmed cotton batting, and laid between the bottles. The cradle should be covered with a thick blanket, a small space at the end corresponding to the child's head being left open to permit the entrance of fresh air.

A thermometer should be placed beside the child, and whenever the temperature is seen to fall below 88° F. one or more of the bottles should be refilled with hot water. The water should not be hot enough to raise the temperature more than a degree or two above 90° F., the object being to maintain as equable a temperature as possible. It is evident that the constant attention which is necessary to secure this limited variation of the temperature is extremely fatiguing, but with proper care it can be accomplished. This care, in combination with equal attention to the other details of treatment, will result in saving a large proportion of premature infants.

Incubators. When circumstances permit, much trouble may be saved, and better results obtained on the whole, by the use of one of the specially devised incubators. The incubators devised by Tarnier and Crédé may fairly be taken to represent the two types which have been most successful. Crédé's has the advantage of cheapness and simplicity. It requires more constant attention than does the Tarnier apparatus, and has been, moreover, rather less successful. The experience of the Boston Lying-in Hospital, in which a modification of this arrangement has been used for many years, shows that the mortality which it yields becomes extremely high whenever any attempt is made to reduce the amount of attention given to it. It consists (Fig. 241) of a tub or cradle made of tin or copper, with double walls and bottom. The space between the walls is filled with hot water, the tub is lined with

Fig. 241.

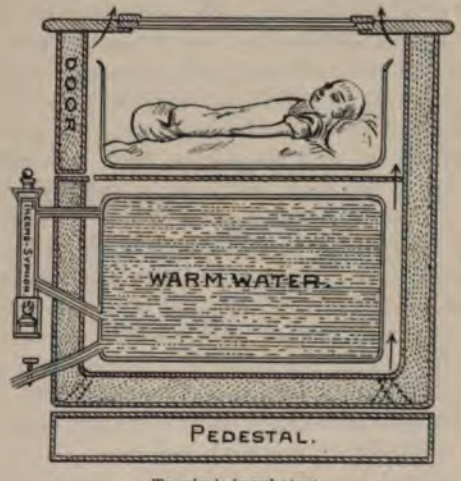
Crédé's incubator.

flannel or cotton-batting, and the child, wrapped in the same material, is laid in it and covered with a blanket. A thermometer is laid beside the child, and another is passed between the walls of the incubator through a hole left for the purpose, so that its bulb is in the water. In the original model uniformity of heat was obtained by drawing off a portion of the water by a stop-cock and replacing it with fresh boiling water. In the modification shown in the illustration the same result is obtained by raising or lowering the gas jet underneath. When any open apparatus similar to this is used it is important to keep the air of the room in which it stands at a high and approximately uniform temperature.

Tarnier's incubator (Fig. 242) consists of a wooden box with double walls 0.10 to 0.12 cm. thick, the intervening space being filled with sawdust to prevent loss of heat. A central partition divides the box into two compartments—the one for hot water, and

the other for the infant's cradle. A metal case with a capacity of about 71 litres fits into the lower compartment, leaving a space of 2 or 3 cm. between its walls and those of the box, to allow the free circulation of air from below upward. The capacity of the upper compartment is about 86 cubic decimetres. There is free circulation of air between it and the lower compartment, and it communicates with the outer air by two openings. One opening is on its upper surface, and is shut in by a double plate of glass; the other opens laterally like a door, and affords an exit for the cradle. In each corner of the floor of the upper compartment there is a hole which allows the free circulation of the heated air from below. A thermo-siphon is attached to the hot-water compartment by two tubes which come from the top and bottom of the reservoir.

FIG. 242.



Tarnier's incubator.

When the lamp under this siphon is lighted the heated water flows through the upper tube into the chamber, displacing an equal amount of the cooler water, which flows back through the lower tube into the siphon. A current is thus established, and the temperature of the water in the reservoir can be raised to the desired point. In cold weather it has been found necessary to light the lamp three times daily, allowing it to burn for about two hours each time. The lamp should be extinguished when the temperature in the upper compartment is about two degrees above the heat desired. The thermometer which registers this should be laid alongside the infant. The temperature should be maintained as near 90° F. as possible, 88° to 92° F. being the extreme limits which are permissible. The children should be wrapped in cotton

or loosely clothed, according to their age. The wrapping should be so arranged that the napkins can be changed five or six times daily with the least possible disturbance to the infant, which should never be lifted from the incubator except for nursing, when that is permitted.

At the Paris Maternité one-third of all the children of less than four and a half pounds' weight have been saved of late years, while at Leipsic the total mortality has been reduced to 18 per cent. In comparing these results, however, it must be noted that the Leipsic statistics include children up to six pounds' weight.

Feeding of Premature Infants. During the first twenty-four hours after birth it is rarely necessary to administer to the child anything more than a little brandy, 2 minims of which should be given in from 10 to 20 minims of warm water every two hours.

It should afterward be fed with a medicine dropper, or by gavage, from 1 to 3 drachms of milk, according to the age and size of the child, being introduced into the stomach every hour.

If for any reason the mother's milk cannot be employed, that of a wet-nurse or properly modified cow's milk should be used. The method by which the food is administered is of great importance. A premature infant at first swallows with difficulty, and if the milk is given by a teaspoon much of it usually runs out of the child's mouth. The prepared milk should be placed in a medicine dropper, the tip of the tube should be passed into the child's mouth, close to the base of the tongue, and the milk expressed drop by drop. This process should be repeated until the required quantity has been given. If this method is successful it may be employed throughout; if, however, the milk is regurgitated, even when so given, Tarnier's plan of gavage should be employed.

Gavage. The infant is taken on the lap, its head being slightly raised, and a soft-rubber urethral catheter, 14 to 16 French, is moistened, introduced into the mouth, and permitted to pass down the œsophagus by the child's efforts at deglutition. The milk is then poured slowly into a small glass funnel, which is inserted into the upper end of the catheter until the desired amount has been introduced into the stomach, when the catheter is withdrawn by a single, quick motion, its slow removal being usually followed by vomiting. If too large a quantity of nutriment is introduced in this way, the child may apparently do well for a time, but the dilatation of the stomach which follows undue stretching usually leads to serious if not fatal disturbances of the digestive function. Two or three drachms of milk are usually well borne except by very small and puny children.

When a seven months' child is four weeks old it may sometimes be dressed loosely and allowed to nurse, but all the other precautions must be rigorously observed until the calculated time of term

is passed, and until the gain in weight and strength appropriate to that time begins to appear.

OTHER PRECAUTIONS. In addition to the careful feeding and the preservation of the body heat, the other precautions which are necessary in the care of the premature infant are principally directed to the removal of all external causes of exhaustion. The baby should be handled as little as possible, and the room in which it is kept should be kept perfectly quiet, for there seems to be little doubt of the fact that noisy surroundings are a great source of exhaustion to a feeble infant. The cradle or incubator should, moreover, be placed so that the child is not exposed to bright light.

CHAPTER XXX.

HEMORRHAGES. THE PELVIC COMPLICATIONS OF THE CONVALESCENCE. INTERCURRENT DISEASES.

SECONDARY HEMORRHAGE.

THE term post-partum hemorrhage is usually limited to a loss of blood occurring within the first two hours after delivery. Any considerable loss of blood after that time is known as a secondary hemorrhage. This secondary bleeding is commonly announced by the patient's feeling the effused blood about the vulva or by sudden faintness on her part. It must be borne in mind that occlusion of the internal os by a clot and subsequent concealed hemorrhage within the uterus is by no means unknown. For this reason any sudden faintness during the puerperium should lead to an immediate determination of the size of the uterus by palpation. The treatment of secondary hemorrhage is in all respects similar to that of post-partum hemorrhage. All clots should be expressed from the uterus or removed manually. Contraction and retraction should be secured by friction over the fundus, the use of ice, etc., and maintained by guarding the fundus with the hand and by the use of ergot.

Placenta Succenturiata. It occasionally happens during the development of the placenta that a few chorionic villi at a distance from the placental site persist, develop, and form an auxiliary or so-called succenturiate placenta. In this case the elementary chorionic vessels which connect the two placentæ also persist and join the umbilical vessels. In these cases it sometimes happens that the succenturiate placenta is torn away from the membranes and left in utero during the third stage of labor. This can usually be diagnosticated by examination of the membranes by transmitted light, when, if a placenta succenturiata exists, it will be seen that large vessels pass off through the membranes from the circumference of the main placenta, and terminate abruptly in torn extremities. If such vessels are found, their existence is a sufficient indication for an intra-uterine search for a subsidiary placenta, since the presence of such a body in the uterus usually results in the production of a secondary hemorrhage after a variable period. The bleeding which occurs is partly due to the detachment of the succenturiata from its uterine site, and partly to its action as a foreign body in distending the uterus.

TREATMENT. The immediate removal of the succenturiata is the only rational method of treatment. This should be performed exactly as has been recommended for cases of retention of the normal placenta. When secondary hemorrhage occurs the possible existence of a placenta succenturiata should always be remembered, and the uterine cavity should be thoroughly explored in search of it after the removal of the clots which are almost invariably present.

PELVIC COMPLICATIONS.

Fibroid Tumors. DIAGNOSIS. Submucous sessile fibroids of the uterus may give no other indications of their presence during the first few days of the puerperium than an undue size and firmness of the uterine body. They become evident later on bimanual examination, owing to the fact that the involution of the uterus is more rapid and complete than that of the tumor. The other varieties of fibroid are easily appreciated by palpation immediately after labor, the irregular contour which they give the uterus being characteristic.

PROGNOSIS. The dangers which their presence involves are those of secondary hemorrhage and septic absorption from possible sloughing of the tumor from the rapid decrease in its circulation during the process of involution. The lochia in these cases may be increased and prolonged by hemorrhages due to the tumors. This is especially common in the pedunculated, submucous varieties; but, on the other hand, the lochia may occasionally be scanty and almost without color. When hemorrhage occurs it is seldom profuse, but it tends to produce exhaustion from its long continuance. Sloughing results in the production of a mass of necrosed tissues situated over a thin spot in the uterine wall. It exposes the patient to the dangers of septic absorption and even of rupture of the uterus during any intra-uterine manipulations which may be undertaken.

TREATMENT. The treatment of acute post-partum hemorrhage due to fibroids differs in no way from that of ordinary post-partum hemorrhage. The treatment of hemorrhage due to fibroids must consist, in ordinary cases, of a systematic administration of ergot combined with a careful packing of the uterine cavity with sterile gauze. In case this fails the only expedient which gives any hope of success is the performance of an hysterectomy, which, however, must be performed before the condition of the patient becomes desperate.

When a fibroid is found to be present and a foul uterine discharge appears, the probability that sloughing of the tumor is taking place becomes so great that a digital intra-uterine examination

should be made. If the tumor is found to be in a broken-down condition it should be removed as gently as possible by a cautious and gentle but thorough and prolonged use of the blunt-wire curette. It must be remembered, however, that the uterine wall at the site of the tumor is probably thin, and is, moreover, often more or less softened by an extension of the necrotic process, and that the greatest care must be used to avoid opening the peritoneal cavity by a too forcible use of the instrument. If in spite of this treatment the symptoms of septic absorption increase, the only hope for the patient lies in the immediate removal of the uterus.

Vulvovaginal Thrombosis. This is one of the few distinctly accidental complications of labor which cannot be avoided by the exercise of due care. It is caused by the submucous rupture of one or more veins from the increased venous pressure of labor. The return of the blood from the pelvis is obstructed during the second stage of labor by the occlusion of the veins under the pressure of the advancing head. If the venous walls happen to be weak, the increased pressure may lead to their rupture and the effusion of blood into any of the submucous spaces of the pelvis. The most common site of this accident is in the bulbs of the vestibule at the side of the vagina, in the immediate neighborhood of the vulva. From this point the effusion may extend upward through the lower tissues below the pelvic diaphragm, or outward under the superficial fascia of the perineum, and exceptionally over the abdomen and thighs. Thrombosis may also occur, though very rarely, in the substance of the cervix.

If the rupture occurs early in the second stage and is followed by an immediate effusion of blood, the tumor may be detected during labor, and may even prove sufficient to form an obstruction to the descent of the head. In a large proportion of the cases, however, the effusion does not take place until after delivery, and the condition remains unsuspected until pain or collapse attracts attention to the possibility of its occurrence. It may occur at any time during the first twelve hours after delivery. The condition may terminate in: (1) Immediate death from loss of blood, without rupture of the tumor; (2) in death from external hemorrhage after bursting of the tumor, which may be the result of simple rupture or of sloughing of its walls from pressure; (3) in septic absorption and sloughing of the involved tissues, or breaking down of the effused blood without rupture; (4) in recovery after the spontaneous resolution of the effused blood, or by healing of the cavity after its evacuation.

Diagnosis. The symptoms which suggest this accident are the appearance of a sudden, severe pain at the side of the vulva, more or less severe collapse without external loss of blood, and, on examination, the presence of an elastic tumor either in the cervix or behind one or the other labium. If the tumor contains fluid

blood it will yield a more or less distinct fluctuation, but after coagulation has occurred it has a more or less boggy feel.

TREATMENT. If the tumor is found during labor, and is not large enough to cause serious obstruction to the advance of the head, immediate delivery by forceps is indicated. If, however, the tumor when first discovered is so large as to prevent the advance of the head it should be incised and rapidly emptied, while the child is to be immediately delivered by forceps. This, however, should not be done until the materials necessary for the control of the resulting hemorrhage are prepared. Immediate delivery is indicated in either case, because the pressure of the head necessarily produces venous stasis and favors the increase of the tumor. This same pressure is, however, sufficient to prevent any immediately serious loss of blood. For this reason no extensive hemorrhage need be apprehended until after the delivery of the child. After delivery in these cases the subsequent treatment is exactly similar to that which should be adopted when the tumor is incised at the time of election. If the tumor is only discovered after labor, or if the delivery of the head is possible without evacuation of the tumor, it is best to quiet pain by the administration of opiates; to enjoin absolute quiet in bed and the avoidance of all straining efforts (for which reason the urine should be drawn by the catheter during the first forty-eight hours); to make persistent use of ice poultices, or of the pressure of a colpeurynter inserted into the vagina and filled with iced water, in the hope of restraining further hemorrhage and permitting the absorption of the effused blood, since this is the most fortunate termination and its attainment is often possible if the tumor is small.

The patient should be carefully watched and examined at least once daily. At the first sign of sloughing, as shown by discoloration or vesication of the surface of the affected labium, or of suppuration, as evidenced by the return of fluctuation, the tumor should be incised. It is better to wait for the advent of these symptoms, not only on account of the chance of absorption, but because an earlier evacuation of the cavity is liable to be followed by a severe hemorrhage, which is unlikely to occur for this reason if operation is delayed until the vessels have been plugged by clots. After the appearance of suppuration or sloughing no delay should be permitted, since further delay only increases the danger of septic absorption.

When interference has been decided upon a good assistant should be procured, the patient should be placed in the lithotomy position, and the parts thoroughly cleansed. The tumor should be opened by an incision of from two to three inches in length along the inner surface of the labium. The clot should be rapidly turned out and the cavity washed out with an antiseptic solution. If hemorrhage

occurs the cavity should be packed tightly with sterile gauze and pressure applied through the vaginal walls. If there is no hemorrhage a light packing should be inserted to ensure free drainage. The packing should be removed at the end of not more than twenty-four hours, and the cavity should be washed out and repacked. Absolute rest in bed should be enjoined. The action of the bowels should be prevented by the use of opiates, and the urine drawn by catheter. The diet should be mainly composed of liquids and of such solids as will produce the least amount of fecal matter, but should always be sustaining, in view of the exhausting effects of the inevitable loss of blood and possible sepsis.

PELVIC COMPLICATIONS OF THE CONVALESCENCE.

This subject has been almost universally neglected in text-books upon obstetrics, being probably considered as belonging to the domain of gynecology, and therefore unworthy of notice. The prevention of subsequent pelvic disease is, however, no minor part of the obstetrician's duty, and the subject of minor pelvic complications arising in the absence of sepsis is of immediate and every-day importance in the management of labor. In speaking of these accidents as independent of sepsis it must, however, be stated that, although they frequently occur without well-marked infection, they are probably, in fact, in otherwise well-managed cases, always due either to the recurrence of previous local trouble, owing to the strains and contusions of labor, or to a mild septic infection which is sufficient to cause local inflammation, although not enough to produce systemic manifestations.

Subinvolution. Subinvolution may effect the uterus, vagina, uterine ligaments, and the abdominal walls. The delay in the normal process of involution may be caused by any inflammatory process, of which the septic inflammations are by far the most common. It may be due to the inability of the ligaments and walls to undergo their normal retraction on account of the constant strain imposed on them by a too early resumption of the erect position. When untreated, subinvolution may result in the production of a chronic pelvic congestion or in any of the uterine malpositions. It is rarely detected before the end of the first ten days of the puerperium, partly from the inherent conditions of the case and partly because the proper observation of aseptic precautions renders it usually unwise to institute a vaginal examination before that time. If, however, at any time during the puerperium or convalescence the characteristic symptoms of heat, sense of weight and dragging, return of the red color to the lochia, backache, and indefinite pelvic pains appear, a careful examination should be made. If the pelvic

organs are found to be large, soft, and sagging, treatment should be instituted at once.

TREATMENT. The most efficient means of treatment consists in the use of copious hot-water douches of from one to four quarts in quantity, given with the patient lying on her back, with her hips somewhat elevated. The water should be injected from a douche pan or fountain syringe under the force of a hydrostatic pressure of not more than two or three feet, at a temperature of from 100° to 110° F. The quantity of water and the degree of heat should be graduated to just the amount which is productive of a sense of comfort to the patient rather than of fatigue. If, as occasionally happens, the use of hot-water douches is followed, in spite of all care, by fatigue, headaches, or exhaustion, they should be discontinued, and the bidaily insertion of small tampons soaked in equal parts of glycerin and water resorted to instead.

The use of ergot in the treatment of subinvolution has been enthusiastically advocated and as warmly condemned. That ergot has the power of initiating and stimulating the process of involution is extremely doubtful. It is undoubtedly useful, however, as an adjuvant to other means of treatment. It is best given as the fluid extract, in doses of from 20 to 30 minims three or four times daily.

Subinvolution of the abdominal walls is most common after great distention, as in the case of twin pregnancy, or hydramnios, and in multiparæ. It is important as being the chief element in determining the loss of figure—a matter of no small interest to most women—and also because the alteration of the intra-abdominal pressures, due to a pendulous abdomen, usually results in the production of pelvic pain after a longer or shorter time. The treatment of this condition should consist in the application of firm and constant, though not excessive, support by a properly adjusted binder. Confinement in bed for a longer time than is necessary under ordinary conditions is important.

Malpositions of the Uterus. Malpositions of the uterus are usually combined with subinvolution, and seldom cause symptoms of importance unless so complicated. Immediately after delivery the uterus normally occupies a position of considerable prolapse and marked anteversion. During the first twenty-four hours it rises to about its normal position by a process of muscular retraction, in which the ligaments take part equally with the uterus. At this time it is so large and heavy that the fundus falls from side to side as the patient moves. For this reason, if for no other, restraint to the dorsal position is not advisable, since the strain on the uterine supports which results from the dorsal decubitus is liable to result in a relaxed condition of the round ligaments and the upper portion of the broad ligaments, and a posterior malposition may be thus

produced. In the same way the overtight application of the binder may result in the production of partial prolapse with or without retroversion.

When either of these displacements has existed prior to pregnancy it is almost certain to recur unless prevented by mechanical treatment. If, however, such treatment is adopted during the latter portion of the puerperium, the displacement may often be permanently cured instead of simply being relieved, as is unfortunately so often the case at other times.

DIAGNOSIS. The diagnosis of malpositions of the uterus must depend upon the previous history of the patient; upon the appearance of pain in the back, groin, or hips, not entirely relieved by rest in bed; upon the reappearance of the red color in the lochia; and finally and most important, upon bimanual examination.

When the existence of such a condition is suspected the patient should be examined during the latter part of the second week, and a pessary of suitable size should be adjusted if a prolapse or retroversion is found. Owing to the fact that the vagina may be expected to decrease rapidly in size, the examination should be repeated at intervals of a few days, and the size of the pessary should be reduced in a constant ratio with the involution of the vagina. The upper arm of the pessary must generally be of unusual length, in order to prevent the production of a retroflexion, which is apt to occur if the heavy fundus is left unsupported and the pressure of the pessary is directed against the middle part of the still soft and flexible uterus.

Pelvic Inflammations. Diffuse inflammation of the connective tissues of the broad ligaments and of the other spaces in the pelvis (accompanied or not by salpingitis) is usually of septic origin. It is, however, not very infrequent in aseptically conducted labors as the result of the contusion of old inflammatory deposits. The symptoms which should lead to the suspicion of such a condition are the appearance of a slight rise in temperature and pulse, accompanied by pain and tenderness in one or both sides. This tenderness is usually less well marked over the uterine body, but is increased by passive motion of the fundus. Such a train of symptoms should always lead to a careful bimanual examination. If a diffuse inflammatory condition is found, the treatment should consist of the administration of small, repeated doses of saline cathartics, combined, if the pain is severe, with the use of opiates. Absolute quiet in bed is essential. The application of large hot poultices over the lower part of the abdomen will often give marked relief. In non-septic cases this course of treatment usually results in the resolution of the phlegmon within a few days.

Cystitis. Cystitis during the puerperium is usually due to the introduction of lochia into the bladder during catheterization, though

a mild vesical irritation may follow a too constant use of the catheter. When cystitis is present the use of the catheter should be avoided as far as possible. If much pain is present it should be controlled by the administration of opiates, preferably in the form of suppositories. The most efficient form of local treatment, and one which is usually promptly successful, consists in the injection into the bladder of 3 or 4 ounces of a 10 per cent. solution of protargol, which should be left in the bladder until expelled by the patient in the natural course of events.

Ureteritis. Inflammation of one or both ureters may develop during the convalescence from the bruising of the ureter during the descent of the head, at the point where the ureter dips over the pelvic brim. The symptoms which should lead to a diagnosis of this condition are pain and tenderness on one side or the other, extending from the renal region toward the groin, combined with a slight rise in temperature and pulse, and tenderness over the vaginal end of the ureter on pressure. The treatment consists in quieting the pain by the use of opiates, if necessary, and in rendering the urine as bland and non-irritating as possible by the exhibition of alkalies.

Hemorrhoids. Hemorrhoids are a not uncommon complication of the convalescence, and are often productive of great discomfort. Treatment should consist in securing free daily evacuations of the bowels and in the application of the ung. gall. et op. The local use of hot-water compresses, or of ice poultices, made by mixing ice broken to the size of a walnut with a sufficient quantity of bran or other coarse meal, will often give great relief.

INTERCURRENT DISEASES.

Pneumonia. It seems probable that in the somewhat lowered vitality which is a *sine qua non* of convalescence from labor there is a somewhat increased susceptibility to acute lobar pneumonia. When it occurs the pyrexia is apt to be rather higher and the prognosis rather worse than in pneumonia in general. It is not infrequently associated with a general septic infection, which renders the prognosis distinctly grave. The treatment is that of ordinary pneumonia.

Scarlet Fever. Scarlatina was formerly confused with the erythematous eruptions which not infrequently accompany septic infections, and was then considered an extremely common complication of the convalescence. It is really very infrequent, however. It may be contracted by a puerpera either by the ordinary channel of infection, through the throat, or by infection of the fresh wounds in the genital tract by the pathognomonic germs of the disease. When

the infection is vaginal the stage of incubation is shortened, averaging from twenty-four to forty-eight hours. The eruption is most marked in the neighborhood of the vulva, and the appearances which are familiar in the throat—*i. e.*, redness, swelling, and pseudo-diphtheritic patches—are found in the vagina. The diagnosis is to be made from a known exposure to the disease and the appearance of the rash. It is sometimes impossible until desquamation occurs. The disease is not infrequently attended by inflammatory pelvic complications. Its prognosis is that of scarlet fever in general, modified by the prognosis of any pelvic complications which may occur.

Erysipelas. Erysipelas during the puerperium is to-day generally admitted to be a form of septic infection. It is to be prevented by rigid asepsis, and its treatment is identical with that of sepsis.

Malaria. A somewhat increased liability to malaria probably exists during the puerperium. Patients who have previously suffered from malarial infection are extremely liable to an exacerbation during the puerperium. The diagnosis can only be definitely made by finding the malarial parasite in the blood. The type of the disease may be very severe, but is ordinarily light. The treatment is that of malaria at any other time.

Acute Articular Rheumatism. A somewhat increased liability to this disease has been alleged to be present during the puerperium, but it is possible that this belief is due to a confusion between septic arthritis and rheumatism.

Delirium Tremens. Labor, like pneumonia, may be followed in alcoholic patients by an attack of delirium tremens, which, on account of the increased nervous excitability of the puerpera, is usually severe. The treatment should consist of forced feeding and a moderate use of the bromides and chloral. If circumstances render it possible, the patient should be left untied in bed, but should be prevented from leaving her bed by the constant presence of a trained attendant. The delusions of delirium tremens are usually those of terror, and a nurse who agrees with the hallucination and promises protection will usually succeed in quieting the patient. Bromide and chloral should be used sparingly. The prognosis of the affection when it once exists is extremely grave, but if the habits of the patient are such that an attack is apprehended, it may often be averted by the administration of moderate doses of alcohol from the moment of delivery. After an attack has once developed the expediency of giving stimulants is doubtful.

Diseases of the Urinary System. The urine of a puerpera is normally increased both in the quantity and in the percentage of the solid constituents; that is, the kidneys are required to perform an increased amount of work during convalescence from labor. There is consequently an *a priori* probability that any previous renal dis-

ease will be subject to an increase of severity at this time, and that such an exacerbation often does occur has been substantiated by clinical experience. Chronic nephritis is not infrequently first detected at this time, but it is probable that in most cases the disease has been of long standing, though previously overlooked.

Septic infection through the urethra and the introduction of foul lochia into the bladder by instrumental means may result in inflammation of any or all portions of the urinary tract. Partial or complete occlusion of the ureters may result from the bruising of prolonged or operative labors.

Neuritis. In anæmic patients an inflammation of one or more of the peripheral nerves may form an extremely annoying, though not a serious complication of the convalescence. The diagnosis is to be made from the pain and tenderness along the course of one or more of the peripheral nerve trunks, with or without a slight rise in the pulse and temperature. Treatment consists in the securing of absolute rest of the affected part, the use of opiates to control the pain, and the free administration of iron and arsenic to relieve the general condition.

CHAPTER XXXI.

DISEASES OF THE BREASTS.

Galactorrhœa. The term galactorrhœa includes the two forms of abnormality—the secretion of a pathologically large quantity of thin, watery milk and a persistence of the normal secretion after the removal of the baby from the breast. The first form may be very exhausting to the mother, almost invariably results in illness of the child if nursing is persisted in, and usually appears toward the end of a long lactation. The second form is less important, but may be extremely annoying to the patient It is usually seen in women who have been fine wet-nurses, after the death or removal of the baby.

TREATMENT. In the first form, weaning of the child, a nutritious diet, rest, light support of the breasts, and the use of iron usually cause the disappearance of the secretion. Atropine and its derivatives are best withheld, because their constitutional effect is seldom desirable for the mother. In the second form the main reliance must be placed upon carefully adjusted and vigorous general pressure upon the breasts, in conjunction with the free use of saline cathartics, or the continued administration of moderate doses of atropine. Large, fleshy women, with an abundant but not overrich secretion, are generally most benefited by saline derivation, while those of more spare build or less abundant secretion are best suited to the use of atropine. If pressure is necessary, it may be applied by a breast bandage or by the dressing of contractile collodion described under mammary abscesses.

Diminished Secretion of Milk. A diminution in either the quantity or quality of the milk is always dependent on some deficiency in the general condition of the mother, and can be combated only by careful attention to the details of her general hygiene, by increase in the amount of fluids ingested, and a highly nutritious diet. Chocolate, cocoa, the heavier beers, oatmeal porridge, eggs, and milk, all enjoy a deservedly high reputation for the diet of nursing mothers. It is, however, frequently more important to secure rest, freedom from care and anxiety, and from other emotional sources of disquiet. It must be remembered that a long lactation is a severe drain upon the vitality of many women, and that when the failure of the milk is secondary to the exhaustion of unduly prolonged nursing there is but little hope of restoring the patient to

her normal condition while lactation continues. An inferior quality of milk is always injurious to the baby, and in these cases weaning should always be recommended and urged upon the mother in the interests of both patients, unless a wet-nurse can be provided.[1]

SORE NIPPLES.

The painful and by no means innocuous lesions which are usually grouped together under this head occur most frequently in primiparæ, an despecially in women whose nipples, from the pressure of corsets or other causes, have become flattened or otherwise deformed. They are best described under the heads of excoriation, fissure of the apex, and fissure of the base.

Excoriations. Excoriation of the nipple is the result of a maceration of its delicate epithelial covering, produced by the constant flow of milk over its surface, reinforced by the friction of the baby's tongue and lips during the act of nursing. It is especially common during the first weeks of lactation, and results in the production of a raw, papillated, strawberry-looking spot, which may be so large as to cover the greater part of the nipple. It is excruciatingly painful when touched. During the intervals between the nursings it frequently becomes covered with small scabs, the removal of which by the nurse or by the act of nursing causes considerable discomfort and perhaps slight bleeding.

PROGNOSIS. The greatest importance of this affection—as, indeed, of all the other forms of sore nipples—lies in the fact that it is very liable to be the starting point of an infection which may result in an extensive parenchymatous abscess of the breast. If allowed to become extensive and inflamed it may form a most obstinate and annoying lesion, but if treated early it may usually be relieved in from twenty-four to forty-eight hours.

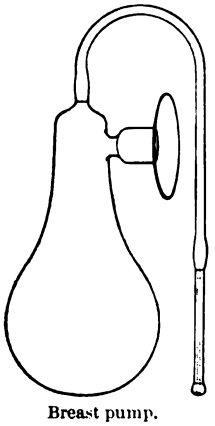
TREATMENT. Excoriations tend to heal rapidly if protected from maceration and mechanical irritation. These objects are to be obtained by the use of some astringent application, and by a temporary discontinuance of the rough handling which the nipple invariably receives from the baby's mouth. The most valuable applications are orthoform, as a powder or in alcoholic solution, powdered tannic acid, the compound tincture of benzoin, and the solid stick of nitrate of silver. Orthoform not only acts as a mild antiseptic, but it renders the nipple anæsthetic for a period of some hours after its application, and its use in combination with a nipple shield is especially valuable. If tannic acid is used it should be spread thickly over the affected surface and covered by a bit of

[1] The treatment of the variations in the chemical constituents of the milk belongs rather to the pediatrist than to the obstetrician.

linen cloth, slightly greased with vaseline to prevent sticking. The compound tincture of benzoin should be applied in several thin, successive layers with a camel's-hair brush, after the nipple has been thoroughly dried with a bit of linen cloth. If nitrate of silver is used, the solid stick should be applied to the affected surface, but not until both the lesion and the surrounding skin have been carefully dried, since the moisture of the excoriated surface is abundantly sufficient, and a too extensive application of the caustic may only result in an enlargement of the excoriation.

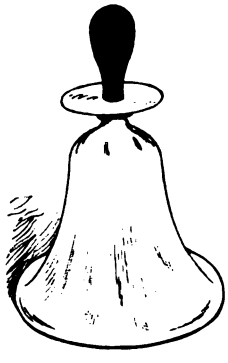
Tannic acid labors under the disadvantage that its use presupposes that nursing from that breast is to be temporarily suspended, since the ingestion of the superfluous tannin from the nipple would almost certainly disturb the baby's digestion. If it is employed, the use of the affected breast must be replaced by the bottle, and

FIG. 243.



Breast pump.

FIG. 244.



Acme nipple shield.

the nurse must relieve the breast at the usual interval by milking it with the hand or by a careful use of the breast-pump (Fig. 243), the difference to the breast between these processes and nursing being that the mechanical irritation of the nipple by the motion of the baby's tongue is done away with. If orthoform, nitrate of silver, or the compound tincture of benzoin are used, it is, however, possible to continue the use of the affected breast by employing a proper nipple shield.

Our own experience has been that either orthoform or the compound tincture of benzoin, in combination with a nipple shield, is, if employed early, thoroughly satisfactory in almost every case; and we believe that many of the physicians who condemn the nipple shield on the ground that it is refused by the baby owe their failures to a want of proper persistence in its use. It certainly is a fact that most babies decline at first to nurse with the shield. If, how-

ever, the shield is properly constructed, if it is applied tightly to the breast, and if after it is in position it is partly filled with milk expressed by the fingers of the nurse, a little persistence in its use always meets with success. Much, however, depends on the form of shield used. Those furnished with a rubber tube should be unhesitatingly condemned on account of the impossibility of securing even approximate cleanliness of the tube—a fact which results in their use being almost always followed by the appearance of stomatitis or more serious digestive troubles in the baby. The best nipple shields are those constructed on the principle of the "Acme" (Fig. 244), which consists of a simple glass shield to which the ordinary rubber nipple is directly attached. After each nursing the shield must be taken apart, thoroughly washed in cold water, scalded, and kept under water in a carefully cleaned tumbler.

Fissure of the Summit. A fissure on the summit of the nipple is simply an extension of one of the natural divisions between the papillæ. It is extremely painful, and may give rise to considerable bleeding during nursing. It is to be treated in the same manner just prescribed for excoriations, except that in this case the cauterization of the fissure with a finely pointed stick of nitrate of silver is distinctly preferable to either of the other applications.

Fissure of the Base. Fissures of the base are crescentic cracks, which are usually situated on the under side of the nipple at its junction with the areola. They occur most often in women who have prominent and pendulous nipples, and are the result of a maceration due to the warmth and moisture engendered by contact between the nipple and the breast when pressed together by the weight of the nipple or by tightness of the clothing. They are to be treated by the application of the solid stick of nitrate of silver. The opposed surfaces must be separated by a small amount of absorbent cotton, and nursing must be temporarily suspended on that side, the breast being emptied by massage until the lesion is healed. After the surface has assumed a thoroughly healthy appearance, the compound tincture of benzoin will be found useful. The use of the nipple shield has been often advised in this class of cases; but as the drawing up of the nipple into the shield tends to open the fissures afresh at each nursing, it is for the best interests of the patient to suspend nursing entirely until the crack is completely healed.

Fissures at the base of the nipple may be extremely obstinate lesions, and if in such cases they become irritated and inflamed it may be necessary to dry up the breast. This final course of action should not, however, be adopted until there seems danger of the formation of an abscess. The necessity for resort to this extreme measure can usually be averted if nursing is temporarily suspended at the first appearance of the trouble. If the nipple is sufficiently

prominent to permit of the application of the dressing, surprisingly rapid healing may sometimes be obtained by holding the surfaces of the crack in apposition with a dressing of absorbent cotton and collodion. A small bit of absorbent cotton should be drawn out into an extremely delicate web, the surface of the crack should be dusted with aristol, and the nipple held in such a position that the crack is nearly closed. The web should then be laid over its surface and fastened to the skin with a thin layer of flexible collodion. This should be allowed to dry and repainted until a sufficiently thick layer has been obtained, another extremely thin web of absorbent cotton being added if necessary.

In the treatment of all forms of sore nipples it must never be forgotten that the most scrupulous cleanliness and the constant employment of such mild antiseptics as can be safely employed in this situation—*e. g.*, a saturated solution of boric acid—are prime factors in the prevention of further trouble, and should never be neglected.

PHLEGMONS AND ABSCESSES OF THE BREAST.

A broken breast, as it is popularly called, is a very tedious, painful, and exhausting disease. When threatened abscess is included under this heading the affection may present itself in any degree of severity, from the slightly hard and tender lump which is due to inspissated milk, and is readily relieved by massage, to a multilocular abscess which occupies the whole site of the ruined gland and is filled with pus or broken-down glandular tissue.

Varieties. Abscesses of the breast appear in three forms: (1) As a superficial or supramammary abscess situated in the subcutaneous connective tissue which overlies the gland itself; (2) as a deep or submammary abscess lying entirely beneath the gland, in the submammary connective tissue which connects the breast to the pectoral muscles; and (3) the most common form, as a parenchymatous mastitis of the gland itself, involving usually both the glandular and the interstitial connective tissues.

Superficial Abscess. Superficial abscesses invariably result from septic absorption by the superficial lymphatics, either from pimples on the neighboring skin or through the surface of simple erosions of the nipple or areola. In either case they are usually the result of a neglect of thorough surgical cleanliness in the care of the breast. They are seldom of large extent. They are announced by the appearance of marked reddening of the skin, and superficial fluctuation develops early. They cause comparatively little pain, and are promptly relieved by early incision and evacuation.

Submammary Abscess. Submammary abscesses, the least common of the three forms, are probably always caused by the burrowing

of pus from small but deeply seated parenchymatous abscesses, which, though they are the cause of the trouble, are usually of but slight importance as compared with the extensive abscesses which follow the escape of the pus into the submammary tissues.

DIAGNOSIS. The occurrence of this form of mammary abscess is marked by a high temperature and dull, deep-seated pain. The overlying skin is not reddened. There is a tendency toward extensive lymphatic engorgement of the axilla. Any movement of the arm on the affected side causes marked pain. As soon as any considerable amount of pus has been formed, the whole breast can be felt to move loosely over the subjacent tissues, and can frequently be perceived to rest on a fluid bed, as it were.

TREATMENT. In the presence of such symptoms, even in the absence of any signs of superficial pus formation, an exploratory operation is advisable. The surrounding skin should be rendered thoroughly aseptic, the breast should be drawn strongly upward, and a medium-sized aspirating needle plunged into the submammary space in a direction parallel to the chest wall, at a point about over the lowest insertion of the pectoralis muscle. If pus is obtained the abscess should be laid open by passing a director along the aspirating needle as a guide, and following it with a blunt-pointed bistoury, or, preferably, with a slender sinus dilator or a pair of scissors. When the instrument is in position it should be expanded to such a degree that its withdrawal will result in sufficient dilatation of the wound to permit the introduction of the index finger. Every effort should then be made to discover the frequently small opening of the parenchymatous abscess, which is probably the source of the trouble. If such an opening is found it should be enlarged by the finger, and any broken-down tissue which may exist scraped out with the finger. The whole cavity should then be syringed out with a 1 to 60 solution of creolin or a 1 to 1000 solution of corrosive. A large drainage-tube should be inserted and an antiseptic dressing applied exactly as will be described in discussing parenchymatous mastitis.

Parenchymatous Mastitis. ETIOLOGY AND PROGNOSIS. This variety of abscess includes the great majority of all broken breasts. It always involves in the end both the interstitial and glandular tissues, but may originate in either of two ways, the distinction being a matter of considerable clinical importance. The abscess may begin as a small phlegmon of the connective tissue, entirely unconnected with the acini of the ducts, in which case it is almost always due to septic absorption from a sore nipple or from the small pimples or boils which are frequent in the areola. It may, upon the other hand, originate from the inspissation of milk in a given duct or acinus. In this case the subsequent suppuration is due to an irritation of the gland, which is excited by the presence within

it of a mass of cheesy and curdled milk, which acts upon the epithelium as a foreign body. This plugging of the acinus may be due to a fermentation of the contained milk, caused by the entrance of some of the ordinary forms of bacteria into the lactiferous ducts and their passage backward into the gland.[1]

In the latter class of cases the threatened abscess first appears as a hard, localized, tender, but not excessively painful lump. It is not attended at first by any marked reddening of the skin, but is usually accompanied by a sharp rise in the temperature without a relative rise in the pulse in most cases. It may usually be promptly relieved if treated early by massage and the subsequent application of ice and a pressure bandage. In the other class of cases the abscess begins as a painful, but ill-defined spot, underlying a sore nipple or a pimple of the areola. There is marked redness and œdema of the overlying skin, which is usually wedge-shaped, occupying the whole segment of the breast. In most cases there is a gradual rise of temperature. This form should be subjected to the ordinary surgical treatment of phlegmons in other situations, but is commonly followed by suppuration, in spite of the most careful treatment.

The most dangerous cases are those in which the original lesion in the nipple or areola is angry and inflamed, while the secondary infection is slow, insidious in its approach, and attended by a comparatively slight rise of temperature and few local symptoms.

TREATMENT. The treatment of parenchymatous mastitis is divided into the observance of prophylaxis; the employment of expedients to avert suppuration, as long as that is possible; and, in the event of its occurrence, a prompt and thorough use of the knife.

Under prophylaxis must be included a careful watchfulness over the condition of the nipple, the strict observance of cleanliness, a free use of lanolin on the nipple and areola, and the constant employment of the utmost possible asepsis during the whole course of lactation.

When abscess formation threatens, the choice between the different methods of conservative treatment which aim to avert suppuration must always be complicated by the question whether or not there is a reasonable hope that the function of the breast can be preserved, or whether the probability of eventual suppuration is already so great as to entirely outweigh the misfortune of the early termination of the activity of the gland, which must always follow the adoption of the more vigorous and safer modes of treatment.

Whatever the form of lesion under consideration, the first essen-

[1] Infections through the milk ducts probably always occur at some stage of the abscess formation, although the primary cause of the blocking of the duct may be due to injury of the epithelial lining of the gland, by a slight blow or similar accident. For this reason it is wise in all cases to warn the patient to observe the utmost care to guard against such an accident.

tial point in its treatment is the immediate removal of the baby from the breast and the promotion of absolute surgical rest of the organ, until pain and tenderness have entirely disappeared or at least become insignificant. This being done, success in the management of these cases depends upon an intelligent choice of the measures to be employed and upon a scrupulously careful attention to the details of the technique, which in doubtful cases should be carried out by the physician himself rather than left to the care of the nurse.

When the trouble is thought to be due to the inspissation of milk within the gland, the expedients at our disposal are the use of massage and of properly applied pressure, together with, in the earliest stages, an attempt at the relief of the congestion, which is always present, by the derivative action of saline cathartics and the local application of ice. When it is thought to originate in the

FIG. 245.

First motion in massage of the breasts.

connective tissues the use of salines and of ice or hot poultices, and the attainment of absolute surgical rest by the application of a bandage for support, but not for pressure, are the only means of treatment advisable.

TREATMENT OF ABSCESSES WHICH ORIGINATE IN INSPISSATION OF THE MILK. *Massage of the Breast.* The whole skin of the affected breast should be rendered slippery by the application of some emollient. Camphorated oil is preferred by many physicians for this purpose. The operator should begin by a gentle and rapidly repeated superficial stroking motion with the finger-tips. (Fig. 245.) Each stroke of the hand should begin with the finger-tips well outside the edge of the breast, and end with them at the nipple. The motions should be made to cover the whole surface of the breast in successive portions, though special attention should, of course, be paid to the affected spot. The stroking should be so gentle as to

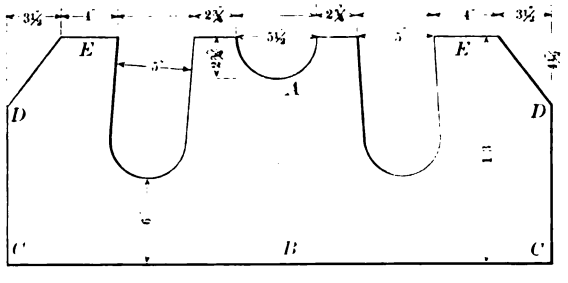
cause no pain, and should increase in force as a tolerance of deeper friction appears. When quite firm massage is but slightly or not at all painful to the patient, the affected lump should be pressed upon by the flat of the hand, and urged gently, but firmly, away from the edge of the breast toward the nipple (Fig. 246) for a few moments, when thick milk is usually seen to flow from

FIG. 246.

Second motion in massage of the breasts.

the mouth of the duct which subtends the lump. When this pressure becomes painful to the patient, as it usually does in a few moments, it should be replaced by a repetition of the stroking movements. This process should be repeated until the whole gland has become soft and flaccid, until the operator fears the patient is be-

FIG. 247.



Pattern of breast bandage used in New York Maternity Hospital.

coming exhausted, or until the original tenderness begins to reappear. The whole breast should then be encompassed by a carefully adjusted pressure bandage, which, to be efficient, must be one of those designed especially for the purpose.

Breast Bandages. Of the various binders which have been devised for the purpose that used in the New York Maternity (Fig. 247)

excels in simplicity and provides adequate compression. It is cut from a piece of stout linen cloth after the pattern given in the diagram, the heavy lines representing the outlines of the finished binder. It is applied by placing it under the patient, with the line A B lying against her spinal column. The bottom corners, C C, are then pinned tightly across her chest, well below the edge of the breasts, which are drawn upward and inward by the hands of the patient during the process of application. A piece of wadding is placed between the breasts, and the edges C D and C′ D′ are then pinned together as tightly as possible from below upward. E E and F F are pinned together across the shoulders, to prevent slipping. (Fig. 248.)

This bandage, however admirable in other respects, is distinctly inferior to that which has been used for many years at the Boston

FIG. 248. FIG. 249.

FIG. 248.—Breast bandage of the New York Maternity Hospital in position.
FIG. 249.—Breast bandage used in the Boston Lying-in Hospital.

Lying-in Hospital, for the reason that it subjects the nipples to unnecessary and perhaps injurious pressure, and that it must be removed whenever nursing is permitted or when the breasts are to be emptied by other means.

The Lying-in Hospital bandage (Fig. 249) may be easily extemporized by fastening together in the shape of a T two strips of very stout linen cloth. The strip which forms the tail of the T should be about four inches broad and long enough to a little more than half encircle the patient's chest. The cross-piece should be nearly double that length, and wide enough to extend from a position one inch below the edge of the patient's breast to the edge of the areola.

This bandage is applied by drawing the tail of the T beneath the patient's back in such a position that its ends appear at the sides, on a line with the nipples, and with the junction of the tail and cross-bar, well external to the edge of the breast on that side. The lower edge of the lower half of the cross-bar should be then drawn tightly across the chest, care being taken to see that it is below the lower edge of the glandular tissue. It is fastened by a safety-pin to the free end of the tail-piece, and is prevented from slipping upward by attaching it to the upper edge of the obstetric binder at two points, which should be opposite the most dependent portions of the breasts. The upper edge of the other half of the cross-bar is then drawn across the chest entirely above the breasts, and is pinned to the other corner of the free end of the tail-piece. It is prevented from slipping downward by shoulder-straps not less than two inches wide, which are attached to it opposite the upper edge of the breasts, carried over the shoulders, and pinned to the tail-piece in the middle of the back. The whole surface of the breasts should then be thoroughly dusted with powdered starch or some other inert powder, and a large wad of absorbent cotton placed between them. The breasts are then drawn strongly inward by the hands of the patient, and the bandages pinned together on each side over the axilla, beginning at the outer edge, and thence working upward toward the nipple, care being taken that the pressure is uniform, except that, so far as possible, it decreases gradually from the axillæ to the areolæ. The edges of the strips should then be brought together between the breasts with safety-pins. When the bandage is in position, it should present the appearance shown in the figure, and should exercise a perfectly smooth pressure over every part of the gland.

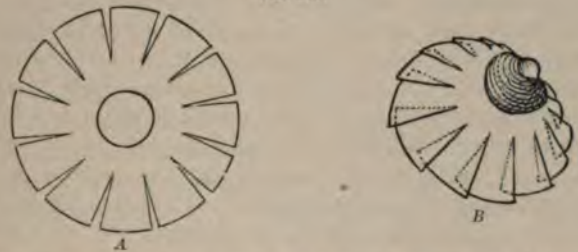
When either of these bandages is being used to exert pressure upon a badly caked breast it should be drawn as tightly as possible without seriously embarrassing the patient's respiration. Its pressure then almost invariably results in the expression of all the milk which the glands contain, but produces so much discomfort that it must usually be loosened after a few hours. Its use should, however, be continued under a lighter tension until the patient has been free from trouble for some days.

A breast bandage may also be employed to great advantage for the support of pendulous or heavy breasts, or for the relief of the engorgement which frequently attends the first appearance of the milk; but when it is applied for either of these purposes a very moderate amount of tension is all that is required.

Contractile Collodion. When the trouble is so serious that it is thought necessary to dry up the breasts at once, and when somewhat marked discomfort is of but slight importance in comparison with a prompt attainment of the most efficient compression possible,

the best results are often obtained by covering the breasts with a dressing of contractile collodion applied in the following manner: A piece of fine crèpe lisse (the best is sold under the name of silk illusion) should be cut in such a manner (Fig. 250) that it can be applied smoothly to the whole surface of the gland, and large enough to extend at least two inches beyond it in all directions, the nipple and areola being left uncovered. The crèpe lisse should be closely applied to the skin and fastened in place with a thin layer of contractile collodion. This should be allowed to dry and be repainted at short intervals until the desired amount of compression has been obtained. The illusion prevents any cracking of the collodion, which would otherwise result in the production of extremely painful fissures of the skin. The dressing often produces, however, a circle of blisters around its edge, and is otherwise so uncomfortable that it should be reserved for extremely threatening cases, in which its great efficiency makes it very valuable. The contractile force of collodion when applied in this way in successive thin layers

FIG. 250.



Crèpe lisse for contractile collodion dressing. *A*. Pattern. *B*. In position.

is so great that the breast can, if necessary, be reduced almost at once to the size of the non-secreting gland, and if kept under this pressure for a period of from twelve to twenty-four hours will almost invariably cease to secrete.

If this treatment—massage and compression—be intelligently applied at a sufficiently early period and persistently carried out, failure to relieve a threatened abscess which originates in inspissation of the milk should be extremely rare. If, however, such a gathering has been left untreated until the connective tissue around the ducts is inflamed, it can hardly be dissipated by pressure alone, and its treatment should be similar to that of those which originate by infection.

The transition from the stage of inspissation to the stage of inflammation is marked by the appearance of increased pain and temperature, by extreme redness of the skin over the affected spot, and, finally, by fluctuation. This last sign is, however, often unobtainable in deep-seated abscess of the breasts.

Treatment of Abscesses which Originate in the Interstitial Tissue. This form is decidedly less common than the preceding, and offers a much less certain prospect of averting suppuration. When this variety is thought to be present an ice poultice should be placed over the affected spot. The pain should be quieted by opiates, if necessary, and the bowels freely opened by saline cathartics. The child should be removed from the breast and the organ rendered immovable by a lightly applied bandage. If, in spite of these measures, the trouble progresses until it becomes probable that suppuration has already occurred, a hot poultice should be substituted for the ice, and the breasts should be frequently examined to detect the first evidence of fluctuation. In case of doubt about the presence or absence of pus it should be searched for with the aspirating needle under aseptic precautions. A medium-sized needle should be used, and ether must ordinarily be given. When the presence of pus has been definitely ascertained, the only proper treatment is an immediate resort to the knife.

Operative Treatment of Mammary Abscess. The patient should be anæsthetized and the skin rendered thoroughly aseptic. An incision about three-quarters of an inch long should then be made through the skin and subcutaneous tissues in a direction radiating from the nipple—*i. e.*, parallel to the larger milk ducts. The site of the incision should be directly over the most dependent portion of the supposed collection of pus. A stiff probe or director should be forced through the tissues into the abscess cavity, and followed by a dilator or pair of scissors. The opening should then be expanded to a degree sufficient to permit the entrance of the index finger, which should then be made to explore every portion of the cavity, should break down all friable tissue, and open up all of the many connected chambers which are usually found. A sufficient number of openings should be made to afford free drainage to every part of the cavity, it being better to make several unnecessary openings than one too few. On account, however, of the danger of the formation of a milk fistula if any large duct is divided, each of these openings should be made by the passage of a long probe or director, under the guidance of the finger, to the point at which the counter-opening is desired. The director should be forced through the tissues until its point is seen to dimple up the external skin. This should then be incised with the knife or scissors in a direction radiating from the nipple, and the sinus enlarged, as before, by dilatation. Drainage-tubes of not less than one-quarter inch internal diameter should be passed through the cavity from opening to opening. The whole breast should then be syringed out by an irrigation, of not less than five minutes' duration, with a strong antiseptic solution. An aseptic dressing and a moderately tight compression bandage should then be applied. The

first dressing is usually promptly stained by the discharge of serum and the remains of the irrigating solution. It should, therefore, be changed at the end of from twelve to twenty-four hours, and the breast should from this time be syringed out, as a rule, daily. If by the fifth or sixth day the discharge is slight, one or more of the tubes should be withdrawn and shortened, since nothing is more likely to produce obstinate fistulæ than the unnecessarily long retention of drainage-tubes. In many cases it is possible to remove them entirely upon the ninth or tenth day, but the exact date of their ultimate removal must depend upon the progress of the individual case and the judgment of the physician. Full aseptic precautions should be observed throughout the whole process.

Arrest of Lactation. It may become necessary to dry up the breasts either at the time of weaning, after prolonged nursing; immediately after delivery, on account of the death of the child, the constitutional condition of the mother, or on account of her previous bad record as a wet-nurse; or during the first few weeks of the puerperium, for similar reasons. After prolonged lactation the glands are usually prepared by nature for the cessation of their activity, and the process of drying them up rarely causes trouble. It is seldom necessary at this time to adopt any other method than putting the baby on the bottle and relieving the tension of the breasts by massage or the use of the breast pump when they become full. The secretion usually ceases under this treatment in a few days. Should a small amount of milk persist for a longer period it may usually be arrested by the administration of atropine, if the constitutional condition of the mother offers no contraindication to the use of the drug. The arrest of the milk when the breasts are at the height of their early activity is, however, a much more serious matter.

If, on account of the death of the child during labor or for some other reason, it has been decided beforehand that the mother is not to nurse, it is best to apply the pressure bandage, or, in some cases, even the contractile collodion dressing, with the first signs of the appearance of the milk, trusting to the natural overflow from pressure to relieve the engorgement, and emptying the breasts, if necessary, by careful massage. If the patient is strong and vigorous, the provocation of a moderate diarrhœa by saline catharsis may often be a valuable adjuvant. The use of atropine is seldom advisable, since the sensitive condition of the puerpera makes the constitutional action of the remedy distinctly undesirable.

If the secretion is already established when the necessity for its arrest becomes apparent the same methods should be employed, but in these cases the frequent relief of overdistention by massage or the breast pump is usually necessary.

Galactocele. It occasionally happens that a milk duct may become permanently plugged, and result, by dilatation of the gland

behind it, in the formation of a cystic tumor filled with milk, which may exceptionally reach an extreme size. The affection is chronic, belongs more properly to surgery than to obstetrics, and can only be treated by the knife.

Milk Fistula. When a lactiferous duct has been opened by a wound or by the extension of an abscess, a fistula results, which may continue to discharge pure milk, or milk more or less mixed with pus, for many months or years. It may sometimes be closed by persistent compression of the breast, and occasionally by the inflammation excited by injections of tincture of iodine, or of a 2 per cent. solution of nitrate of silver, administered two or more times weekly with a small syringe. It may sometimes, however, prove so intractable as to yield to nothing but the curette, or may even require a dissection of its tract and the removal of the offending acini.

CHAPTER XXXII.

SEPTIC INFECTION.

PUERPERAL fever is a term which has been used from very ancient times to designate the febrile affections of the puerperal period; but since it and all its varieties have now long been recognized as arising from a common cause—*i. e.*, septic infection during the puerperal state—they are to-day properly grouped under the generic term, septic infection. The different varieties of septic infection—which were formerly known under the names of lymphatic fever, venous fever, etc.—are now recognized as being an infection due to different bacteria, which vary in their virulence and characteristics, and thus produce a marked diversity of symptoms.

ETIOLOGY AND PROGNOSIS. Puerperal sepsis is, in the vast majority of cases, due to infection produced by the introduction of the infective bacteria from without; in other words, the pathogenic organisms are introduced into the parturient canal by the attendants at the time of labor or during the puerperium, for experiment has shown that the pathogenic organisms are very rarely present in the vaginæ of pregnant women who have not been subjected to examination. It is undoubtedly true that cases of autogenetic infection do occasionally occur, but the attendant must be able to prove satisfactorily the existence of previous pelvic inflammation before pregnancy occurred in order to be able to shift the responsibility of the infection from his own shoulders.

Each case of septic infection, no matter what organism is the cause, must be studied from two stand-points—*i. e.*, the local manifestations which it presents, and the systemic intoxication which accompanies them; and in accordance with the result of this investigation each case must be grouped in one of the three classes into which all cases of puerperal sepsis may be divided clinically.

Class 1. The characteristic feature of the cases which belong in this group is decomposition of the secretions or of any clots which may have been retained in the uterus or vagina. Some absorption of the products of decomposition almost invariably occurs, and results in a slight degree of pyrexia and malaise. The vaginal discharges are distinctly foul in odor.

Class 2. The cases of this class are characterized by the presence of marked local lesions accompanied by a varying amount of

constitutional intoxication. Pyrexia is always a constant symptom, varying in degree from a slight to a severe febrile movement, which is sometimes accompanied by chills. Constitutional intoxication is always present to a greater or less extent, and varies in different cases, according to the nature of the infection, from a moderate to a severe degree.

Class 3. The chief characteristics of the cases which belong to this class are comparatively slight local lesions accompanied by severe constitutional intoxication. Pyrexia is always intense, and is usually accompanied by repeated chills. In the typical cases the patient looks extremely badly, but, owing to a stimulant intoxication from the large amount of toxic products absorbed, feels well.

These three forms of clinical sepsis are produced by different infective bacteria, so that this classification is scientifically as well as clinically correct, and the prognosis varies with the clinical aspect of the case.

Bacteriology. *Class 1.* The infective agents in the cases which belong in this division are the saprophytic bacteria which produce decomposition. They are anaërobic in type, and do not tend to invade the deeper tissues. They act principally by causing decomposition of the lochia and of any clots which may have been retained in the uterus or vagina. The prognosis in these cases is usually good, even without treatment, although there may be some slight extension of a mild inflammatory process along the mucous membranes. The prognosis is always good if local treatment is applied.

Class 2. In this class of cases the infection is usually due to one or more of a definite group of bacteria, although other forms may occasionally be found. The most important members of this group are the staphylococcus, the Klebs-Loeffler bacillus, and the colon bacillus. The prognosis in this class of cases is usually bad unless prompt local treatment is adopted, but generally good when it is promptly applied. Any of these common infections may be complicated by infection with the streptococcus, and in these cases the prognosis varies with the promptness of the treatment and the virulence of the streptococcus.

Class 3. The third class includes those cases in which the streptococcus is present either in pure culture or as the predominating element in mixed infections. The prognosis depends more on the number of streptococci present and upon the virulence of the individual streptococcus than upon any other factor. It is often hopeless without treatment, and none too good even if prompt treatment is applied.

Action of the Individual Bacteria. *Saprophytic Bacteria.* The saprophytic bacteria produce decomposition of the fluids which have already been exuded by the walls of the genital tract. As the

result of the absorption of the toxins which they form in their growth they may give rise to a moderate toxæmia and to slight local inflammatory changes.

Staphylococcus. The staphylococcus is seldom found in pure culture, and typical cases of infection with this organism are rare. Its chief characteristic is a marked tendency to localized pus-formation, with a mild degree of general intoxication. The chief local complications which accompany its growth are abscesses of the uterine wall, phlegmons of the broad ligament, tending to break down to pus, and occasionally purulent salpingitis.

Klebs-Loeffler Bacillus. This organism produces a diphtheritic membrane on all the lacerations and raw surfaces which may be present in the vagina, cervix, or uterus. It develops rapidly, produces virulent toxins, and its growth is attended by a marked intoxication from the start. The organism itself tends to remain localized at the point of infection, without invading the deeper tissues for a long time, and in this situation is promptly amenable to local treatment—more so, in fact, than in any other portion of the body.

Colon Bacillus. The colon bacillus has a strong tendency to localized abscess formation, but from an early stage of infection also tends to produce metastatic abscesses in various portions of the body. These are, however, frequently very superficial and easily accessible to treatment. Although this is its typical mode of action, the effects it produces are often very variable, and it is impossible to predict what its course will be in a given case.

Streptococcus. The streptococcus shows very little tendency to the production of local lesions in the genital tract, but is disseminated rapidly through the lymphatics to all the organs of the body, and produces ultimately minute necrotic abscesses in all the solid viscera —*i. e.*, the liver, spleen, kidneys, brain, etc.

Gonococcus. Infection with the gonococcus is far from rare, and this organism has peculiar characteristics of its own. If infection occurs at the time of labor, the gonococcus tends to produce the ordinary results which occur from its growth in the non-pregnant state—*i. e.*, a severe purulent inflammation of the mucous membranes, which remains localized to them throughout, and from which the patient usually ultimately recovers. If the mucous membranes are already infected with the gonococcus at the time of labor its tendency is to produce temporary salpingitis, with a large collection of fluid, which usually escapes by draining through the uterus within a few days. The ultimate prognosis in these cases is usually good as far as the life of the patient is concerned, but the morbidity is very high.

The presence of chronic infection due to the gonococcus also lowers the general resistance of the tissues and renders infections

with the other organisms more probable and the prognosis rather more doubtful than it would otherwise be.

Pneumococcus. The pneumococcus presents the general characteristics of a modified streptococcus, and is apt to produce a very virulent infection.

Bacillus of Tetanus. The bacillus of tetanus may be introduced into the open wounds of the genital tract as well as into other portions of the body. Its results, prognosis, and treatment are unchanged by its situation.

Bacillus of Malignant Œdema. When the bacillus of malignant œdema is introduced into the uterus it rapidly invades the uterine bloodvessels. It grows rapidly, its growth is accompanied by extensive gas-formation, and the patient dies suddenly, presenting the clinical appearances which are commonly ascribed to air embolism.

Puerperal sepsis may be produced by any of the pathogenic bacteria, but those which have been described are the only ones which are sufficiently common to deserve a definite description.

General Symptoms. The general symptoms of septic infection —*i. e.*, those which are present in all three classes of cases—are pyrexia to a greater or less degree, with its associated symptoms—headache, rapid pulse, and furred tongue and the signs which are always present in any process which is accompanied by a local inflammation—tenderness, heat, swelling, and generally a foul discharge. It must be noted, however, that a foul discharge is not a necessary symptom, and that in many of the most dangerous cases the lochia are practically normal in odor.

Special Symptoms. *Class 1.* In the cases of the first class the most characteristic symptom is the foul odor of the lochia, which may vary from that commonly described as cheesy up to that of true putrefaction. There is at most only a mild degree of pyrexia present, and it is attended by very slight depression and malaise. The pulse in particular shows little or no change from the normal. Exploration of the vagina or uterus may reveal the presence of large, slightly decomposed clots.

Local Symptoms. *Class 2.* In Class 2 the local symptoms are always marked. The lochia are usually profuse in quantity and dark red in color during the first few days after the infection has taken place, owing to the congestion which accompanies its inception, but later fade in color and become scanty. They usually have a distinctly foul odor. On examination the vaginal mucous membrane is found to be reddened and swollen, and all the lacerations and raw spots may be found to be covered with a pseudomembrane, which may be due to the action of the Klebs-Loeffler bacillus or may sometimes be produced by other bacteria. The uterus is large, boggy, and tender, and curettage shows the decidua to be swollen, spongy, and more or less increased in amount. As the disease

progresses bimanual examination often shows the uterus to be firmly fixed, and may also reveal the presence of large pelvic masses intimately connected with it, which may be made up of phlegmons of the broad ligaments, enlarged tubes, or encysted pelvic peritonitis.

Tympanites and vomiting may accompany these local changes.

CONSTITUTIONAL SYMPTOMS. The constitutional symptoms which ordinarily accompany any sharp febrile attack vary with the severity of the infection, but are apt to be present in a marked degree. These comprise an increased frequency of the pulse-rate, headache, thirst, nausea, and a furred tongue. In the absence of marked mixed infection with the streptococcus the patient is apt to be flushed and uncomfortable and to feel much worse than she looks. In the later stages the lochia, milk, and other secretions are apt to dry up.

This is the class of cases which is most commonly followed by the development of a phlegmasia.

LOCAL SYMPTOMS. *Class 3.* The local symptoms which are present in Class 3 grade imperceptibly from those which are found in the mixed infections of Class 2 up to an almost entire absence of local symptoms in the cases of pure infection with the streptococcus, the pneumococcus, and the bacilli of tetanus and malignant œdema. The uterus may even be thoroughly involuted, and not tender.

CONSTITUTIONAL SYMPTOMS. The constitutional symptoms in Class 3 are very severe. The pyrexia is intense; the pulse is rapid in rate and poor in quality; the patient looks very badly, but owing to her marked intoxication feels well.

Gonococcus. The lighting up of an old gonorrhœal infection is apt to be marked by a sudden, moderate pyrexia, with its attendant symptoms and the development of large masses on one or both sides of the pelvis. Although these cases are often extremely alarming, they usually take care of themselves with proper nursing and rest in bed.

DIAGNOSIS. The diagnosis of puerperal sepsis presents a double task. In the first place, it must be determined whether sepsis is present or not, and, in the second place, the form of the sepsis must be diagnosed. Suspicion of the existence of septic infection should be aroused by any of the symptoms which have been mentioned, but it must never be forgotten that the pyrexia and other symptoms may be due to the onset of an intercurrent disease, and the differential diagnosis depends on the results of a thorough physical examination.

In the absence of the local symptoms of infection, and in the presence of any sign of disease elsewhere, it is fair to exclude sepsis; but in the absence of the signs of any intercurrent disease, and in the presence of any of the local signs of infection, the diagnosis must be sepsis.

The most common affections which may complicate the puerperal state are tonsillitis, pneumonia, typhoid, malaria, and occasionally the ephemeral febrile diseases. An absolutely normal temperature for five or six days after delivery practically excludes sepsis unless a possibility exists that the patient may have been infected after delivery.

The presence or absence of tonsillitis is to be determined by a careful examination of the throat of the patient.

Pneumonia can only be diagnosed by the appearance of the signs of pulmonary consolidation. In the case of a central pneumonia the diagnosis may be impossible during the first two days after the onset of the symptoms, and a mistaken diagnosis of sepsis may be made before the pulmonary signs become evident.

The diagnosis of malaria can only be definitely made by finding the malarial parasite in the blood on microscopical examination, but the characteristic periodic variations in the temperature may furnish strong presumptive evidence.

In certain cases it may be impossible to differentiate typhoid from sepsis in the early stages of the disease. If the blood of the patient gives a positive Widal reaction the diagnosis is, of course, clear; but until this can be obtained the diagnosis must depend upon the general clinical picture which the patient presents, and upon the entire absence of any local lesion of septic infection.

The ephemeral febrile diseases can only be diagnosed by the absence of any of the local signs of sepsis, by the presence of a local epidemic—*e. g.*, of grippe, etc.—by the acute onset and equally rapid recovery, and by the general clinical picture they present. In all cases in which a careful physical examination fails to reveal the presence of any intercurrent disease the provisional diagnosis must be sepsis, and the pelvic organs must be subjected to a thorough examination in the search for the local lesions of infection. The uterus should be palpated through the abdominal wall, and any variations from its normal size or any increased degree of tenderness should be carefully noted. The next step in the examination should be a careful bimanual examination of all the pelvic organs, from which can be learned the following points: The size and consistency of the uterus, the degree of involution, the general condition of the uterine appendages, and the presence of any inflammatory masses. The vagina should now be thoroughly dilated by means of a large Sims speculum, and the whole mucous membrane of the vagina and cervix should be carefully inspected in search of the local signs of infection.

In order to make the examination complete it is necessary to take cultures from the uterine discharge, as this is the only way in which the organism to which the infection is due can be definitely ascertained. Two methods have been recommended for taking the

cultures, the first one being the more simple and easy, while the second one is the more accurate and scientific. Both methods require that the vagina shall be thoroughly distended with a large Sims speculum and thoroughly swabbed out with corrosive, after which a large cervical speculum is introduced. In the simpler method a sterile swab is now passed through the cervical speculum to the fundus of the uterus, care being taken that it does not come into contact with the vaginal walls during its introduction. The swab is allowed to remain in place until it has become well soaked with the uterine lochia, when it is withdrawn, placed in a sterile tube, and conveyed to the laboratory for examination. In the second method, which was devised by Williams, a sterilized glass tube, open at both ends, is substituted for the swab. This is passed through the cervical speculum to the fundus of the uterus, and suction is applied to the outer end of the tube by means of a small, sterilized hand pump, until the tube has become filled with the uterine lochia. The tube is then withdrawn, sealed at both ends, and sent to the laboratory for examination. This method has the advantage of being more accurate than the other in that it reduces the chances of extraneous contamination to a minimum, but is less convenient and demands more in the line of preparation, as an ordinary swab, such as is used for taking cultures from the throat in diphtheria, is all that is necessary for the former.

TREATMENT. *Prophylaxis.* The most important advance which has been made in obstetrics has been in the prevention of sepsis. The aseptic precautions which should be taken in every case have been discussed in the chapter on asepsis, and need not be repeated here.

When sepsis is already present the treatment should be divided into those measures which are directed to the support and stimulation of the system as a whole in its warfare against the invading poison, and those which are intended to prevent further absorption of the septic poison by the removal of the local lesion, its source of supply. Both are of great importance, but as no improvement in the patient's condition can be expected while the local lesions are still active and spreading, the source of absorption of septic products should, if possible, be removed or at least limited.

Local Treatment. The decision as to whether local treatment is to be adopted or not depends upon the conditions demonstrated by the careful investigation of the case just described. This decision rests primarily upon two factors: the form of the local lesion which is present and the stage of the disease in which the patient is first seen. The local treatment of the various lesions when seen early will be described in detail; but, no matter what they are, if the disease is well advanced when the diagnosis is first made we must remember that nature's method of cure is by shutting off septic foci

by an exudate of lymph, and great care must be taken not to destroy this natural protection. In neglected cases any large superficial masses which are present should be removed gently, without breaking down the defence, and then all local meddling must be absolutely given up. Too great emphasis cannot be laid on the importance of an early diagnosis, as this alone allows us to make a clean removal of the disease.

When the first suspicious symptoms pointing to infection appear, the whole genital tract should be thoroughly explored without the slightest delay. The strictest antiseptic precautions should be employed, and if any suspicious lesions are discovered a vigorous attempt to disinfect them should be made.

The vagina should be carefully cleaned, and its surface should be so thoroughly exposed that no part of it can escape the eye. If the surface of the cervix is normal, if the cervical lochia are sweet, and no marked tenderness is present, the uterine cavity should be left undisturbed. A swab should be taken from the cervical lochia in all cases, so that by bacteriological examination the presence of infection of the uterus and the nature of the infection may be determined in all cases. If any suspicion of infection of the uterus arises, the cleansing process should begin at the fundus. The local applications which should be used vary with the conditions discovered in the individual case.

Class 1. Decomposition of the retained clots or lochia in the vagina may usually be relieved by a thorough vaginal douche of a 1 to 3000 corrosive sublimate solution, which may be repeated daily if necessary.

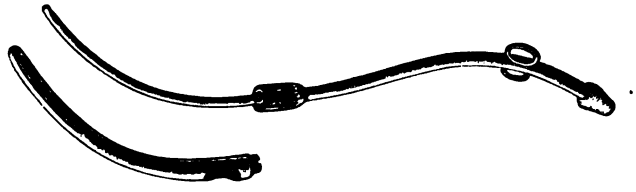
Class 2. If the gray, pseudomembranous patches are found they should be dusted with iodoform after the vagina has been thoroughly cleansed with the corrosive solution. If the lesions are severe, they should be cauterized by the thorough application of 95 per cent. carbolic acid to every portion of the diseased surface, or by the similar use of a strong solution (gr. lx to ℥j) of nitrate of silver, after which the surface may be dusted with iodoform.

Endocervicitis and endometritis are to be recognized by the foulness of the uterine discharge. According to the nature of the infection, the inflammation may remain localized in the endometrium for a considerable time, or the infection may be spread rapidly by the lymphatics into the substance of the uterus or to the peritoneum. This extension can usually be diagnosed by the appearance of more or less marked tenderness of the fundus on palpation. The milder cases may be relieved by the intra-uterine douche, but in most cases of septic endometritis the thorough curettage of the whole uterine cavity with a large curette is indicated at once, since the failure of the less radical methods of treatment makes the condition worse, as in the time thus lost the infection has extended more and more

deeply into the uterine tissues. The technique of each procedure will be described.

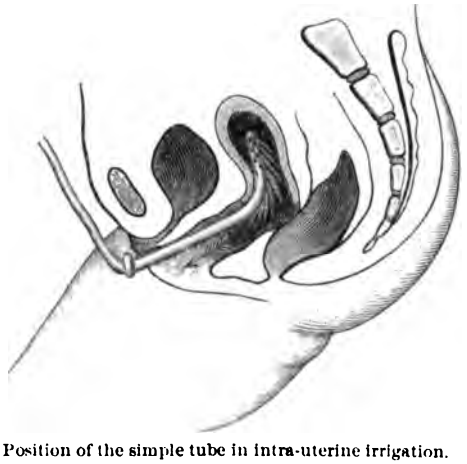
Although intra-uterine injections are of limited value by themselves, they are of great use in keeping the interior of the uterus clean after the major portion of the diseased tissue has been removed by the curette. Their use in the main is attended by no unfavorable symptoms, but if their temperature is too high or too low they may be followed by alarming collapse. If the return of the injected

FIG. 251.



Bozeman's double-current intra-uterine catheter.

FIG. 252.



Position of the simple tube in intra-uterine irrigation.

fluid is not carefully provided for, or if too high pressure is used, some of the fluid may be forced through the Fallopian tubes into the peritoneal cavity, with disastrous results.

The danger of sudden death if air is introduced into the uterus is much overestimated, and little fear need be entertained on that account, although it should be guarded against. The proper giving of a douche requires, however, an accurate knowledge and observance of the proper technique.

In the absence of any specially constructed douche tube a sterilized, male, silver catheter which has been bent to the proper curve may be used. The double-current intra-uterine catheter devised by Bozeman (Fig. 251) and improved by Kelly is widely used; but for puerperal cases it has few, if any, advantages over less complicated instruments, and its device for ensuring the prompt return of the injected fluid is less satisfactory than the natural one which is afforded by the patulous os in puerperal cases when held open by the simple pressure of the catheter or intra-uterine tube against its anterior wall. (Fig. 252.) The intra-uterine tube may be made of glass bent to the proper curve, or of metal—*i. e.*, of some material which can be efficiently sterilized by boiling. For a long time it has been asserted that the most important feature of a well-constructed intra-uterine tube is that it shall have several lateral openings, preferably pointing backward, and no opening in the end. If, however, a proper outlet is provided for the return of the injected fluid, the position of the openings in the tube is of little or no importance. The tube may be attached to any form of syringe, but a fountain syringe is decidedly preferable. If a Davidson or other bulb syringe is used the basin which contains the solution should be held above the vulva to establish a siphon current, and thus minimize the danger of the introduction of air into the uterus. The solution should be a 1 to 4000 corrosive or 1 to 60 creolin. If corrosive is used it may be followed by a 1 to 40 carbolic-acid solution or by sterile water, to avert the danger of mercurial poisoning, an accident which is especially apt to follow intra-uterine injections. The temperature of the solution should be not less than 105° nor more than 115° F., since the careless use of hotter water is not infrequently followed by sharp collapse, while a lower temperature may be productive of a very uncomfortable chilliness.

Everything being in readiness for the douche, the patient should be placed in the lithotomy position. The vagina should be distended by the largest speculum which can be introduced, and the vagina and cervix carefully cleansed by scrubbing them with an antiseptic solution. The injection fluid should be allowed to run through the tube until the operator is satisfied that no air remains in the syringe. The tube should then be passed gently into the uterus, without interruption of the flow, under the guidance of the finger, and should be at once drawn forward toward the pubes in order to ensure patency of the internal os for the return current. The tube should be gently moved from side to side, and the injection should be continued until the return flow is colorless and free from detritus. Throughout the procedure the physician should watch the returning fluid constantly, in readiness to shut off the current at the first sign of an incomplete return, since the uterine orifices of the Fallopian tubes are often patulous, and the entrance

of the injected fluid into the peritoneal cavity is perfectly possible and greatly to be dreaded.

If the intra-uterine involvement is limited to a very mild affection of the endometrium, or to decomposition of the uterine contents, the use of the intra-uterine douche may be sufficient to restore the parts to an approximately aseptic condition, and is then followed by prompt subsidence of the symptoms; but in the majority of cases it fails to remove the whole focus of infection. For this reason, and because the exact condition of the interior of the uterus can rarely be accurately ascertained, even by digital exploration through the patulous os, it is in general the best plan to resort to the use of the curette as a routine in all cases in which the uterine lochia are distinctly foul. This is justified by the fact that the careful use of the curette should never be productive of harm, while the positive results which almost invariably follow the thorough removal of the decomposed contents of the uterus are sufficiently marked to warrant a much more dangerous procedure. The theoretical objection that the curette makes a fresh wound, and that its use is therefore likely to be followed by an extension of the infection, is to be answered by the fact that in practice this does not happen, if it is used early and preceded and followed by an antiseptic douche. The best curette for post-partum work is the large placental curette. It should be so bent that its curve is slightly greater than that of the uterus, with its sharper edge toward the concavity of the curve. It should be introduced into the uterus under the guidance of the finger, and passed with a gentle oscillatory movement from side to side over the whole anterior wall of the uterus. It should then be withdrawn with a series of scraping movements. This process should be repeated until every portion of the wall yields the firm, almost grating sensation which is characteristic of uterine tissue. The curette should then be withdrawn, its shank should be bent to a curve somewhat less than that of the uterus, with its sharp edge toward the convexity of the curve, and in this position should be made to explore every portion of the posterior wall in a similar manner. The lateral walls of the uterus should then be subjected to similar treatment, the curve of the curette being adapted to them as may be necessary.

Metritis and peri-uterine inflammations can only be reached by the removal of the endometritis which precedes and causes them, when nature usually effects their cure.

Salpingitis, ovaritis, and inflammations of the pelvic tissues are to be detected only by bimanual examination. They are beyond the reach of local applications, and should be treated by the application of poultices to the abdomen, by copious vaginal injections of boiled water, prolonged rest in bed, diuretics, and the moderate use of saline cathartics. In the presence of severe pain the moderate

use of opiates may be permissible, but in general it is to be avoided. These forms of pelvic infection may terminate in resolution, or may go on to abscess formation and require operative interference for their relief.

The diagnosis between the several varieties of pelvic inflammation enumerated is only to be made by careful bimanual or recto-vagino-abdominal examination. This should be sufficiently prolonged and thorough to furnish the physician with all obtainable information, and should not be repeated without definite indications, since frequent repetitions of the intrapelvic manipulations not infrequently increase the trouble. The diagnosis once established, the main guide for treatment is to be found in the condition of the temperature and pulse and in the general aspect of the patient. As long as these signs show progressive improvement it is wise to be content with expectant treatment. It must be remembered, however, that when the patient begins to fail, or the signs of general infection appear, her chances often deteriorate with startling rapidity. It is therefore wise, when a patient who has been steadily improving begins to lose, to abandon expectant treatment as soon as the loss is sufficient to be definitely perceptible, and turn at once to the resources of surgery. Surgery can, however, almost always be postponed until after the puerperal state is long past, and then belongs to the realm of gynecology rather than to obstetrics. When an operation is absolutely necessary, the vaginal route should be preferred on account of the great fatality of abdominal operations in acutely infective cases.

The abdominal operation needs no special description here. If the vaginal method is chosen, the vagina should be rendered aseptic by prolonged scrubbing with hot soap and water and an antiseptic solution, and then exposed by a large-sized Sims speculum. A transverse incision should be made across the posterior aspect of the infravaginal portion of the cervix, close to the cervico-vaginal junction. The incision should divide the mucous membrane only, which should then be freed from the cervix by blunt dissection of the submucous tissues. If more space is needed, it may be obtained by a second incision, beginning in the middle of the cervical cut and extending directly backward through the vaginal mucous membrane in the median line. These flaps should be dissected upward, layer by layer, until the operator is persuaded by sight or touch that he is in the close vicinity of the peritoneum, which forms the floor of the fossa of Douglas.

The remaining steps of the operation must then be determined by the variety of the lesion present. If the patient is suffering from a phlegmon of the broad ligament, the instruments should be laid aside and the patient turned into the dorsal position. One finger should now be pushed cautiously upward at the side of the

uterus by a tearing dissection, while the other hand pushes the pelvic mass downward by pressure on the abdominal wall. All inflammatory tissue should be thoroughly broken down, care being taken not to open the peritoneal cavity, and the cavity packed with iodoform gauze. At the end of twenty-four hours the gauze should be removed and the cavity washed out and repacked. It is wise not to irrigate the cavity at the time of operation, as the possibility exists that the operator may have opened the general peritoneal cavity accidentally, and experience has shown that this accident seldom results seriously unless septic material is washed upward into the peritoneal cavity by irrigation.

When vaginal section is performed for the purpose of opening an encysted peritonitis or an abscess of the appendages, the dissection should be continued upward until the wall of the abscess cavity pouches down into view, a phenomenon which will certainly occur under the pressure of the intra-abdominal force as the supporting layers below it are divided. The abscess wall should then be divided as widely as possible and the cavity packed.

Septic Metritis. In certain cases of septic infection of the uterus which have not been adequately treated at the start the uterus becomes thoroughly infected throughout. Localized necrosis and pus-formation may take place within the substance of the uterine muscle. Bimanual examination shows the uterus enlarged and tender. Internal examination of the uterus, either digital or with the curette, shows that the fundus is so softened by the septic process that any but the very gentlest manipulation is practically certain to result in perforation. These cases generally do badly, but some recover under constitutional treatment. All local meddling must be avoided.

Septic Peritonitis. Peritonitis as a result of septic infection after labor may be either local—*i. e.*, limited to the pelvis—or diffuse.

Pelvic peritonitis may be caused by leakage from the tubes, by extension directly through the uterine tissue by the lymphatics, or it may follow pelvic cellulitis. If it is due to extension through the tubes or to pelvic cellulitis, an ovarian abscess is a possible complication. A sharp pelvic peritonitis is the result. The process may be, and in most cases is limited by the large amount of peritoneal exudate which is thrown out and which checks its extension. A large portion of the abdominal cavity may become in this way apparently solidified. On palpation the abdominal contents feel hard and solid. The patient holds her abdominal muscles rigid, on account of the great tenderness on pressure. The symptoms are not alarming, and the common termination of this form of peritonitis is in recovery. The symptoms subside gradually. The exudate is absorbed, the tenderness disappears, and the temperature falls to normal. As a rule, few ill effects are left behind; but, on the

other hand, the exudate may break down and encapsulated abscesses be formed, which may discharge through one of the surrounding viscera or undergo caseous changes.

General peritonitis may develop after labor from the extension of a pelvic peritonitis, from infection from tears in the uterus or vagina, from the rupture of old pus collections in the pelvis, from the sloughing of pelvic tumors, or from infection brought by the lymphatics. If the purulent peritonitis is not limited by an exudate the intestines become loosely glued together. They are bathed in a thin pus which collects in pools among their coils, and they are covered with a fibrinous exudate. In the most virulent (streptococcus) form of septic peritonitis (peritonitis lymphatica) the patient may die before pus or exudate is formed. At autopsy the abdomen is found filled with a dirty, serosanguineous fluid, which contains great numbers of the bacteria. In all cases paralysis of the muscular coats of the intestines ensues, and marked tympanites develops.

DIAGNOSIS. The diagnosis of pelvic peritonitis is to be made by observation of the general symptoms in conjunction with the local signs. There is a more or less marked rise in temperature, with rapid pulse and general depression; then marked tenderness appears over the lower abdomen, and tympanites develops. Vaginal examination shows an exudate in Douglas' fossa, which is usually very sensitive to pressure The exudate is usually firm and hard. If it feels soft and boggy, suppuration is probably going on.

General peritonitis usually develops suddenly and runs a rapid course. It usually appears early in the puerperium. The ordinary symptoms are extreme distention of the abdomen; a rapid, wiry pulse of poor quality, and in the majority of cases a high fever, great pain, and perhaps localized dulness on percussion, though these signs may be absent. The anxious, pinched expression of the face, known as the peritoneal facies, is always present. Uncontrollable vomiting is also a constant symptom.

TREATMENT. It is impossible to predict whether pelvic peritonitis will in the individual case result in resolution or in suppuration. In the hope of resolution taking place the treatment should always be expectant at first. Counter-irritation and poultices should be applied over the lower abdomen. Saline cathartics should be given to the point at which a mild diarrhœa is produced. Copious hot vaginal douches should be given, and in extreme cases vaginal section may be indicated.

In general suppurative peritonitis treatment rarely saves the patient's life. The only chance lies in the immediate performance of abdominal section, with free irrigation of the abdominal cavity; but even within twelve hours of the onset of the symptoms the prognosis is extremely bad.

Class 3. It has already been said that in cases of this class no local treatment is indicated, and our whole reliance must be placed on constitutional treatment.

Constitutional Treatment. The general treatment of puerperal sepsis is directed to keeping up the strength of the patient, and in this way to counteracting the effects of the toxins which have been absorbed. The patient should be given as much food of an easily digestible character as she can be persuaded to swallow. Milk and its preparations, eggs, raw oysters, and the like, form the best diet for a septic patient. Alcohol should be given in the largest amounts that the patient can take without showing the physiological effects. Digitalis is useful if the pulse is over 110 beats. Strychnine is the best of all remedies, and may be given in heroic doses frequently repeated, beginning with a thirtieth of a grain every three hours and increasing to the point of toleration. To tide the patient over sudden emergencies due to heart failure, large doses of carbonate of ammonia, given per rectum, and the hypodermic injection of nitroglycerin may be necessary. Inhalations of oxygen may be of service. The further points in treatment to be observed are absolute rest, freedom from disturbance, whether mental or physical, and the best nursing that the family can afford.

Serum Therapy. The use of subcutaneous injections of the anti-streptococcus serum has of late years been strongly advocated. The results obtained have not been sufficiently favorable to warrant placing any great dependence on its use. If the active infectious agent is other than the streptococcus, no results are to be expected from the serum. Recent bacteriological research has demonstrated the fact that the streptococcus includes a group of organisms with somewhat varying characteristics, instead of being a perfectly definite organism of unvarying characteristics, as was formerly supposed; and the somewhat limited trial which the serum has had in cases of pure streptococcus infection points to the probability that an antitoxin prepared from one member of this group is inert toward the other members. In certain cases the results of its use are undeniably good, but our knowledge is too limited at present for us to predict what cases will or will not be helped by it, and the future of serum therapy in the treatment of puerperal sepsis is to-day merely a matter of conjecture.

Treatment of Septic Infection by the Artificial Production of Hyperleucocytosis. A large and influential school of pathologists look on phagocytosis as the natural means by which septic infection is cured. They have, therefore, made attempts at the treatment of puerperal sepsis by the production of an artificial leucocytosis. The principal agents which have been demonstrated to have the power of increasing the number of white corpuscles in the blood are albumose and nuclein. Pilocarpine has a similar effect, but its

action is so depressing on the heart as to render its use unsafe. The results from this treatment are as yet too few to establish its true importance, but they give reason for the hope that in combination with local disinfection it will prove of practical value.

Intravenous Saline Infusion. The washing of the blood by the intravenous injection of normal salt solution, or of modified Ringer's solution, has met with considerable success in the treatment of puerperal sepsis. Injections of large amounts of this fluid (two quarts or more) into the lower bowel seem to give just as good results, and are much more convenient.

Phlegmasia Alba Dolens, or Milk Leg. This affection is an extensive thrombosis of the veins of the lower extremities. The left leg is the more commonly affected. Both legs may be involved in the process together, or one after the other. The affection usually begins between the tenth and the twentieth day after labor, but in rare cases it antedates labor. It may appear in either of two ways —as a primary phlegmasia starting from a thrombosis at the ankle and extending upward, or as a secondary phlegmasia due to the extension of a thrombosis of the pelvic veins downward into the veins of the extremities. The primary form may be engrafted on a simple case of varicose veins; the secondary form is always due to infection.

The affected limb becomes swollen, tender, and painful, and it pits on pressure. The skin is white and shiny from the extreme distention. The temperature rises, though seldom to an extreme height. Mild delirium is frequently present. The acute stage of the affection lasts from two to five weeks; then the swelling, pain, and tenderness gradually subside, but weakness, dragging pain, and diminished muscular power may be noticeable for weeks or months afterward. The prognosis, though usually good, may be grave when the affection is secondary to well-marked sepsis, as in this case extensive suppuration or even necrosis may follow and give rise to serious if not fatal exhaustion. The mildest cases may be followed by the detachment of a portion of the clot and sudden death from embolism. This culmination is, however, rare in properly treated cases.

TREATMENT. The affection demands both general and local treatment. The general treatment is that of any exhausting disease—*i. e.*, supporting. The patient should be forced to take the greatest quantities of nourishment possible. Alcoholic stimulants should be avoided, unless the general condition of the patient is such as to distinctly indicate their use, because the increased activity of the circulation which they induce increases the danger of embolism.

Sedatives should be administered to the extent of quieting the pain and keeping the patient quiet. The affected limb should be

wrapped in cotton-batting covered with oiled silk, and immobilized by being enclosed in a folded pillow as a splint.

Absolute rest of the leg is imperative, and all manipulations of it should be strictly avoided on account of the danger of embolism. The patient should be kept absolutely in bed, and the limb immobilized for at least two weeks after the final disappearance of the swelling, by which time it is fair to presume that the thrombi in the veins have become organized. After the acute stage has subsided and the patient is allowed to get up, she should wear an elastic stocking or a rubber bandage as long as any disability of the limb is perceptible.

CHAPTER XXXIII.

THE INSANITY OF GESTATION.

THE insanity of gestation differs from mental disease in general only in its cause. It appears under the forms of mania or melancholia, either of which in the later stages of severe cases may develop into chronic dementia. It is seen about once in four hundred labors on the average; but the percentages reported from different countries and different classes of practice vary widely. It is most common among women exhausted by long lactation, overwork, or worry, or among those who are illicitly pregnant. It is comparatively rare among the better classes and in married women.

ETIOLOGY. The etiology of this unfortunate complication has not as yet been definitely established. An hereditary tendency toward mental disease is undoubtedly the predisposing cause in a large proportion of cases. Anæmia may exercise a causative influence of some importance. Albuminuria is present in a certain proportion of cases, but its etiological importance in the disease has not been established. Sudden bereavements, grief, anxiety, the shame of illicit pregnancy, and obstetric sepsis—all act in certain cases as the directly exciting cause.

Moral Impressions. The mental changes which attend the progress of most normal pregnancies are well known and widely recognized. Alterations of manner and temper, whims and caprices, and unusual tastes and desires occur with considerable frequency, and are attended by a certain loss of equilibrium of the mind and nervous system. If this physical condition occurs in a woman whose inheritance already predisposes her to insanity, and is accompanied by marked anæmia, the fatigues of a painful or delayed labor, or the exhaustion of sepsis, it is by no means surprising that the mind should give way. Excessive brooding over the terrors of an approaching labor was thought by Fordyce Barker to predispose strongly to insanity among primiparæ, his views being founded on the fact that he had seen such cases in the wives of physicians who had probably been injudicious enough to examine their husbands' obstetrical libraries.

Anæmia. Marked anæmia is present in a large proportion of all cases of the insanity of pregnancy or the puerperium, and the comparatively favorable prognosis of these cases as contrasted with other forms of mental disease has commonly been attributed to the

possibility of removing by treatment this important element in the causation. The exhaustion and anæmia which follow prolonged lactation are thought to bear a similar relation to the insanity which sometimes appears at that period.

Septic Infection. Mild sepsis has of late years been accepted as a frequent though not constant element in the mental diseases of the puerperium. In this connection it is important to remember, however, that some cases of infection are attended by early and pronounced delirium, which may lead to a mistaken diagnosis of insanity In practice the distinction is to be made largely by the comparatively short duration of a mere delirium and its prompt relief by the arrest of the septic process.

CLASSIFICATION. The class of mental diseases under consideration is usually divided into the insanity of pregnancy, parturition, the puerperium, and lactation.

Insanity of Pregnancy. During pregnancy the mental disorder usually takes the form of a mild melancholia, and most of the attacks are to a certain extent intermittent and easily managed. Delusions are rather uncommon. The patient is depressed and apprehensive, and the ordinary affairs of life cease to interest her. She is often apathetic and careless, and her family affections frequently become obscured or are replaced by an unnatural aversion. This form of insanity usually disappears immediately after delivery. It seldom necessitates removal to an asylum, and is comparatively rarely attended by inclinations to suicide or violence.

Insanity of Parturition. It is generally admitted that distinct though transitory insanity may occur during the later stages of labor. The trouble, however, rarely goes beyond a temporary but almost maniacal excitement, due to intense pain, and is of rare occurrence since the introduction of anæsthesia. It is often attended by a desire to injure or destroy the child, which may persist for some minutes after delivery.

Insanity of the Puerperium. This usually appears during the first few weeks after labor, and generally assumes the form of mania. It may follow a marked exaggeration of the ordinary psychoses of pregnancy, or it may develop suddenly and without prodromal symptoms. It is usually preceded by a temporary state of depression or irritability, and not infrequently by a vague apprehension of impending trouble. Attempted violence to the bystanders or to the child is not infrequently the first sign of insanity noticed. The patient becomes noisy, excited, and incoherent. The memory is impaired and the mind wholly disordered. The mental tone may be that of good humor or of irrational rage. In her frenzy the patient may exhibit a physical strength and endurance quite foreign to her ordinary habits or abilities. Delusions of dread or suspicion are by no means uncommon, and are especially likely to be directed

toward the patient's dearest friends and relatives. A not uncommon and most distressing symptom is the use of the most foul and obscene language and a tendency to give the most public expression to the most disgusting ideas—a phenomenon which has been considered by many to be related to the origin of the trouble in a function of the genital organs. Insomnia is almost constant. The digestion and other vital functions are always impaired. The temperature may be somewhat elevated, especially in the afternoon, even in the absence of septic infection. Any pyrexia should, however, always excite suspicion, and should occasion a careful search for a possible septic complication.

Insanity of Lactation. This usually appears at the end of prolonged nursing in patients who are distinctly exhausted and anæmic. It usually appears in the form of melancholia.

PROGNOSIS. The prognosis of these different forms of insanity is greatly obscured by the fact that the reported statistics vary widely. It seems probable that under approved methods of management about 60 per cent. of cases recover. The maniacal type is the more immediately dangerous to life, while melancholia is more often followed by prolonged or permanent loss of reason.

TREATMENT. The first and perhaps the most important question in the management of these cases is whether the patient shall be transferred to an asylum at once or allowed to remain in her home. There is no question but that the equipment and surroundings of an institution devoted to the purpose offer the patient a decidedly better chance of recovery. On the other hand, the prejudice against commitment is so great, and the stigma which attaches to it so lasting, that in the majority of cases the consent of the friends is refused so long as a reasonably hopeful prognosis can be given. A physician is unwise, however, who assumes the care of such a case outside of an asylum unless the circumstances of the patient are such as to permit her to have the constant care of two trained attendants, since it is absolutely necessary that she should be watched without intermission as long as any degree of alienation exists, and because a person who is unused to the care of the insane is almost certain to be duped by their cunning.

If the experiment is undertaken, every effort should be made to assimilate the condition of the patient's surroundings to those which would be afforded by an institution, especially in the direction of absolute isolation from noise, excitement, and the visits of friends. No person whatever should be allowed to enter the patient's room except the professional attendants, and every effort should be made to suppress the ordinary noises of the household.

The next point of importance is a careful estimation of the causative elements which are most prominent in the individual case. Should the slightest focus of infection be found, no efforts should

be spared to eradicate it as promptly as possible and to combat the exhaustion it causes by forced feeding. If the attack has been preceded by a condition of anæmia, much can be expected from a thorough course of treatment with iron. This treatment will prove more effective in many cases if combined with arsenic.

In all cases the condition of the bowels must be carefully attended to. Fresh air, sunlight, and, so far as possible, cheerful surroundings are of the utmost importance. The use of hypnotics is a matter which calls for the exercise of great caution and of much judgment. Paroxysms of maniacal excitement may sometimes be controlled by hypodermic injections of full doses of morphine or by the hydrobromate of hyoscin similarly administered, in doses of from $\frac{1}{200}$ to $\frac{1}{100}$ of a grain. The bromides, in doses of from 30 to 40 grains, and paraldehyde, in doses from 1 to 2 drachms, are sometimes valuable. In the insomnia of melancholia trional and sulphonal in combination are sometimes efficacious.

In the insanity of pregnancy the question of the propriety of inducing labor may occasionally arise; but this expedient should never be resorted to unless the mental alienation has already reached an exaggerated and dangerous type, since the manipulations necessary to its performance are not infrequently sufficient to determine the appearance of such a form. When delirium or any mental trouble or excitement appears during labor, it is always the duty of the physician to administer an anæsthetic and deliver at once, since the birth of the child is almost invariably followed by the disappearance of the trouble.

Pregnancy of the Insane. It was formerly thought that women already insane might be favorably affected by the influences of pregnancy and parturition. Modern observations, however, furnish so little support for this theory that it has been wholly abandoned, and pregnancy of the insane is to-day regarded as wholly unjustifiable, since it not only brings no benefit to the mother, but results in the birth of a child whose heredity marks it at once as an undesirable addition to the human race.

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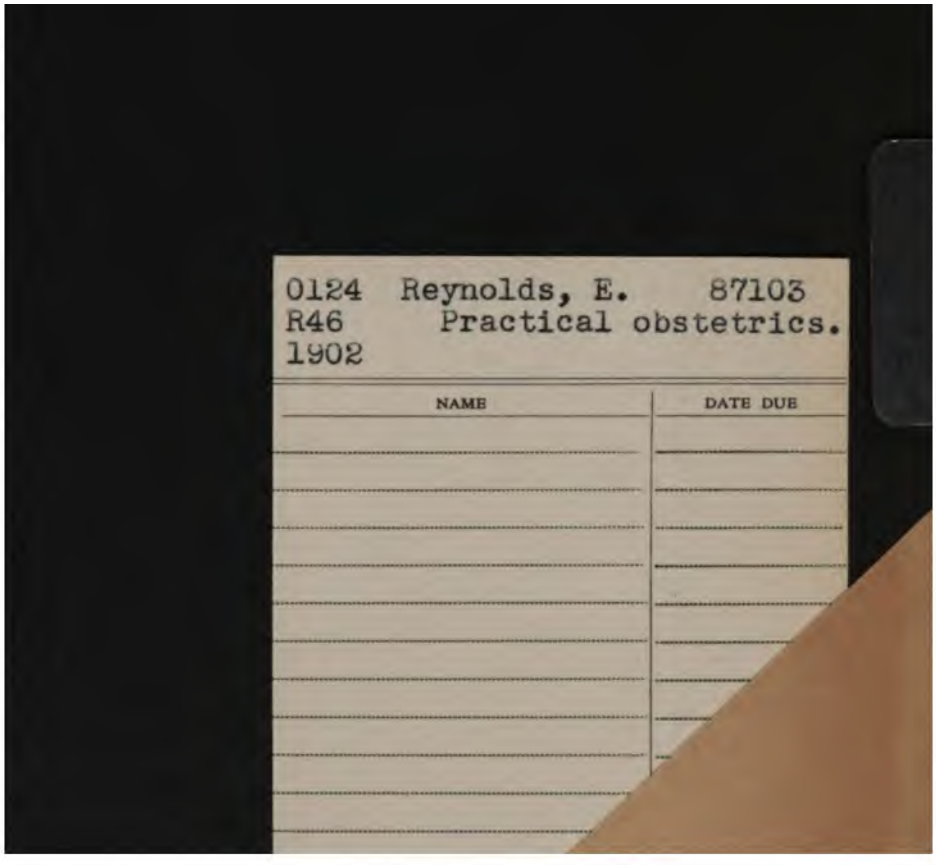
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